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EDITORIAL ANNOUNCEMENTS.

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CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

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VOL. XLII., No. 18. FRIDAY, MAY 3, 1907.

The American Railway Association is in favor of making a strong effort (which will involve the expenditure of much time and money) to bring about the general pooling of freight cars, as a remedy for the widespread misuse of cars. This much seems certain: though the railroad officers who, believing the thing possible, have carried this vote, also recognize, as does every careful student of the subject, that unknown difficulties may impose unending delays. Hence the adoption of a penalty for diversion as a temporary relief. Even this partial measure of relief is slow—not to be put in effect for five months—indicating what a tremendous problem is being dealt with. The hardest thing in connection with a pool is to find the big, impartial man—the Albert Fink—to administer it. Somebody, either with or without a velvet glove, must exercise the iron hand very often. As an experiment in this line the Association has voted that the chairman of the Car Service Committee is a suitable person to fill that kind of a position—a well-merited compliment to Mr. Hale. The only test of a man's ability to successfully do arbitrary things is actual trial, and in the proposed diversion rule we shall have such a trial. Mr. Carnegie's beautiful essay on the essentials of natural justice leaves his readers sad and unsatisfied, because he gives them no light on how to find the most essential element of a court of justice—a judge. The railroads have recognized and avoided that rock. The most diverting feature of the diversion rule is that under which a road which is in hard luck will be dealt with tenderly. This is tempering Justice with Mercy—with a big M. The fact that the St. Louis & San Pedro has stolen some of your cars will excuse you for stealing some from the Cape Cod & Baltimore Air Line. However, it is a condition of the business world and not a theory of the halls of justice that now has to be dealt with, and the 95 per cent. provision is not to be criticized. Rather, it may prove the one relief valve that makes the machine workable. Moreover, an arbitrator who finds himself unable to do justice is always at liberty to denounce injustice by publishing the reason for his inability.

For a scholarly, accurate, detailed and interesting account of the dangers of color blindness and some other defects of the human vision, the reader in search of a few minutes' entertainment could not do better than turn to the article on "Railway Disasters at Night," by a professor in Johns Hopkins University, published in the *Century Magazine* for May. But the article tells nothing about railroad disasters, either by night or by day, and there is no hint that the discussion is 15 or 20 years behind the time. The author's one point, that illuminated semaphores should be used for railroad signals, so as to have shape instead of color, by night as well as by day, is put forth simply as an academic proposition, with no reference to practical working conditions. It is astonishing that a conservative popular magazine should print such an inconclusive and wholly theoretical study. One would almost conclude that the writer of the article was born in a psychological laboratory (not Dr. Scripture's, however), and had never been out of it; but the practical side of the question is so completely ignored that it seems a more reasonable supposition that he knows of the hard realities, and omits mention of them—as the colored preacher omitted mention of chicken stealing—because it would throw a coldness over the spirit of his audience. The editor of the *Century* should have told his readers that the railroads have long since done away with the dangers of color-blindness, by taking color-blind men off from their engines; that illuminated blades for semaphore signals have been tried persistently and have been found ineffective from a scientific standpoint, as well as useless practically (because, with the danger from color-blindness removed, colors [red and green] are simpler and more satisfactory); that night shape signals were used in all the semaphores of the Boston & Albany for 15 years, and yet were finally rejected as no better than color signals; that records of actual disasters from color-blindness or the other visual dangers mentioned are as hard to find as hen's teeth, though the question has been a live one for 30 years; and that the mazes of lights to be seen from the cabs of fast express engines in city yards at night, which are held up as the greatest danger of all, have been scaring *passengers* in locomotive cabs—even railroad superintendents—for the past forty years, and yet have worried the enginemen themselves only in exceptional cases. Enginemen have made blunders of many kinds, but blunders due to confusion of lights are of the rarest. In other words the arrangement of the signal lights in our great yards is in fact simple though seemingly it is confused. The really valuable feature of this magazine article is in its second paragraph: the declaration that "the perils of travel spring from something

more central than signal posts or wires or colored lights; there can be no substitute for earnest and intelligent good will." With every manager, superintendent and locomotive runner exercising this quality, railroading will be safe even with "clumsy appliances and outworn aids." Intelligence and conscience in every cab would make many of our signal refinements unnecessary.

Railroad Commissioner L. J. Storey, of Texas, recently addressed a convention of lumbermen in a tone so fair and reasonable that it must have given fresh courage to the much legislated against railroads of that state. Commissioner Storey said that the principal problem nowadays was to determine how best to secure more and better railroads and better service with less friction between shipper and carrier, on just and equal terms, without discrimination for or against any person, place or thing. He said further that this increase of railroad mileage and this better service and increase of facilities could not be secured by an unwarranted and radical reduction, as demanded by the demagogue as he goes forth every two years in search of votes, denouncing the railroad commission as a failure and as a servant of the corporations. We are frank to confess that we had not heretofore heard the Texas Railroad Commission described as a servant of the corporations, and we feel that there must have been a change somewhere; perhaps it has been occasioned by the Texas commission being constant, while a wave of legislative radicalism has swept past and over it to a new high-water level. At all events, Commissioner Storey cannot be placed among those who legislate for votes and for revenge, for he is flat against the proposed two-cent passenger bill, and he said that a majority of his commission had voted it down because they believed the time had not come when all the roads could stand such a reduction of their revenues. We venture to say that this is not precisely the test which the western and southern legislatures have been applying. Commissioner Storey shows that all the roads in Texas had a balance, after payments for the 1906 fiscal year, of $1,122,504, and that a two-cent passenger law would have changed this to a deficit of $3,283,447. One may be permitted to wonder whether the Texas legislature and the other state legislatures that are trying to get more work out of a horse by reducing its feed, are interested in calculations of this kind. Whether they are or not, the Texas commissioner's speech at least points a moral that may be a comfort to those viewing newly created state commissions with alarm, and that is that it may be accepted as the maxim that commission legislation, year in and year out, is going to be less radical than direct legislation, and that the sooner the state legislatures leave such topics as two-cent passenger bills, restriction of capitalization, and reciprocal demurrage to their commissions, the better it will be for all concerned. The wisdom of a legislative body is pretty sure to vary inversely as its size, and a railroad commission is much smaller than a state legislature.

A NEW ENGLAND RAILROAD SITUATION.

While great and stirring events in the general railroad situation in this country have been absorbing the interest both of the public and of railroad managers, and while civic and economic policies in their bearings on corporations have been thrust forward prominently, there has been developing a situation in New England worth more than passing notice. In some remote aspects it is related to state polity. But it concerns more immediately the interests of the affected railroad corporations themselves.

Previous to a date that may be roughly fixed at a quarter of a century ago the railroads of the six New England states were substantially independent corporations. There had been mergers of certain lines whose operation and interests were almost identical and, in some cases, those mergers affected a considerable volume of traffic. Nevertheless the New England railroad system as a whole was made up of segregated units representing all railroad types—short roads, through roads, rival roads and not a few roads in large industrial valleys doing a profitable local business. The first long step in consolidation came with the Boston & Maine absorptions of the later eighties and early nineties merging under centralized control the large properties north of Boston and stretching over Maine and New Hampshire. Next the vaulting ambitions of President McLeod led to antagonism with the New Haven, to the conflict for control of the Connecticut River road, and to the events which forced the New Haven to take in the Stonington and Old Colony systems right away. There followed what was dubbed at the time "The Partition of Poland," by which, under agreement, tacit or formal, northern New England went to the Boston & Maine, southern New England to the New Haven, with the conservative and unassertive—not to say old fogy—Boston & Albany as a kind of neutral line of boundary posts between.

Thus there was created a kind of triple alliance, a balance of railroad powers and pacific conditions not much disturbed by events until a few years later. The Boston & Maine meanwhile contented itself with its Fitchburg and Massachusetts Central acquisitions. The New Haven's purchase of the Housatonic and New York & New England were merely defensive steps inside its own territory, and the Boston & Albany, while maintaining its regular prosperity, jogged along unaggressively and its transfer to the New York Central did not change its essential status. Such unity of interest was also in evidence as the joint occupancy of the Boston South Station by the Central and New Haven companies.

This balance of power condition, which promised to last long, has during the last three years suffered a rude change. While two of the parties have "stood pat," the third—the New Haven corporation incarnated in President Mellen—has gone ahead by leaps and bounds. Historically it has been like a swift campaign of Bonaparte against dilatory Austrian or Prussian. Pursuing the martial figure of speech, southern New England under Field Marshal Mellen is in arms while central and northern New England have not even equipped their reserves. The preliminary Mellen strategy has been picturesque as well as defensively prudential. It has included the Ontario & Western purchase to the coal fields and the great lakes, with potential western extension; the purchase of a vast electric railway system reaching into the territory of the other two old divisions of "Poland"; new terminal plans at New York City, modifying, if not menacing, the old terminal arrangements below Woodlawn; and now, at the last, an expansion of the marine branch from the sound to the ocean, reaching southward to half a dozen through railroad systems with an incidental "big stick" to club the Morse interests. Against this policy, primarily defensive but with large offensive powers, involving great outlay of funds, the only resistive measure has been the feeble effort of the New York Central to reach Boston from New York City by a cut-off through northwestern Connecticut—a plan that appears to have been thwarted by the obstructive change in the Connecticut general railroad law.

This campaign of tireless energy in southern New England as against inertness in the center and north, has had some other striking features. Theoretically nowadays it should have given legislative offense and roused public fear as extending and solidifying monopoly. Practically the effect seems to have been exactly the reverse. The two southern New England legislatures have been acquiescent, even concessive; and even the Massachusetts legislature and executive, last year severely critical of steam railroad ownership of trolleys, seem now to have paused while Boston appeals to "monopoly" to save it from Mr. Morse. On the other hand, in northern New England, New Hampshire is still in the convulsions of an anti-railroad movement and Vermont has enacted a set of new railroad statutes that makes most of the western anti-railroad legislation seem tame. In the submissive legislatures of southern New England there may be some restrictive law-making hereafter; but, if so, it will be aimed probably not at monopoly or extension but at matters relating to railroad finance and public supervision. Without much effort the assertive New Haven method has secured from the law-making authority all that it has asked, and, if it asks more, will get it.

But the main interest of the New England railroad situation is not so much in the forces external to it as in the situation itself and its contrasts. Within a region of the country thickly settled and of high industrial intensity three railroad systems, two of them large, are placed. Two of them have adopted policies comparatively inactive; the other has been and is, in the language of trade, a "hustler." It has reached out north, south, east and west, has grasped trolleys and steamboat lines, has pushed into rival territory, has expanded capital. Thus far its policy, whether viewed as one of aggression or self-protection, has prospered; but it has yet to be searched by antagonisms—one of which may, perhaps, be descried on the Morse horizon and by the sharper test of hard times. The history of American railroads has supplied somewhat similar cases of bold policies on the one hand and conservative policies on the other, with diverse results. We have had the slow Chicago & Alton policy which for many years was successful, and the radical Gowen policy on the Reading which for so many years failed. The result in such cases is apt to depend on the sagacity and skill of its original projector. But, as compared with other American examples, the New England situation is novel as trying

out the two policies in homogeneous railroad territory, at very close quarters and with their consequences hereafter to be depicted, so to speak, upon the same screen.

LOCOMOTIVE PERFORMANCE DATA DEVELOPED AT PURDUE.

It seems curious in the light of the recent experimental information that has been obtained regarding the action of the several parts of the locomotive, that the world should have waited for it so long. It is not so very long ago that the use even of the indicator upon the locomotive was rare or unknown, and our only means of testing, if it could be called testing, was to ride upon the engine and observe general results. This was followed by road tests that involved so many variables that the real object of the work was sometimes buried beneath a mass of uncertainties. So when it was proposed by Purdue University to build a laboratory plant upon which a full-sized locomotive could be tested under constant conditions it was received with the warmest acclaim by the railroad world and the greatest interest was at once manifested in the probability of obtaining valuable results. Whether the promoters of the scheme had a clear idea of what was to be the outcome, we are not informed, but if they had they must have been endowed with a most remarkable foresight.

The Purdue testing plant has given rise to others, and the results of the investigations that have been made have been so prolific of good that this method of testing has now come to be recognized as the only one upon which reliance can be placed, and the records of Purdue and St. Louis form the most valuable contributions to the literature of the locomotive extant. When it is remembered that in 1890, before the opening of the Purdue laboratory, we had no definite idea of how the draft of a locomotive was produced and that every engine driver was a law unto himself as to the adjustment of the smokebox details; that the action of the fire was almost unknown; the influence of tube length a mystery; the quality of steam supplied to the engine a pure guess, and the economical efficiency of the machine, as a whole, a matter upon which there was a general agreement to the wrong, namely, that it was extravagant in the use of coal and steam, we can see that much was to be learned, much more than was realized at the time.

Seventeen years of constant, painstaking effort has borne fruit a hundredfold, and we have learned so much that we are realizing more and more every day how much there still remains to be done. We have learned that there is a scientific method of adjusting diaphragm and petticoat pipe and stack and netting and front end proportions in order to secure maximum efficiency with a minimum of back pressure, and if this one thing were all that we had to show, it would fully repay for all the trouble and expense. To remove the smokebox from the realm of guesswork and settle definitely the relation of steam jet to entrained air, and size and diameter of stack was a great achievement and deserves all the praise that has been given it.

Then come the clear cut definite statements that have been made regarding the value of high steam pressures. In the early eighties, when 125 lbs. was the standard, it was felt that more would be better and tentative efforts were made that soon raised that standard to 140 lbs. Then as facilities for boiler construction were increased, the pressures advanced by leaps and bounds until now many engines have been built designed for 200 lbs., for use with simple expansion, but here the warning hand from Purdue has been raised and we are given an unmistakeable demonstration, admitting of no criticism, that we are too high and that 185 lbs. is the point at which steam pressure in a single-expansion engine reaches its point of maximum efficiency.

And how about the quality and consumption of that steam? We guessed that it was damp and that much water was entrained into the cylinders, and guessed wrongly, for we are now told definitely that though "the locomotive is often credited with carrying over a great deal of water to the cylinders, the tests show that this does not happen under constant conditions of running." Then comes the greatest surprise of all, in the fact that the engine is not only not wasteful but is exceedingly economical in the use of steam and that it is quite capable of developing a horse-power on less than 25 lbs. per hour, and that good average practice ranges in the neighborhood of 30 lbs. This is probably at least 25 per cent. lower than the average motive power man would have guessed before this scientific research was placed on record.

We learned many years ago that the boiler was the limiting factor in locomotive performance. Wheels of large diameter and cylinders of large capacity availed us nothing for the production of high speeds or great power unless we could get the steam with which to operate them. So we increased the sizes of our boilers and added to our heating surface and raised our pressures until we reached the limits of human endurance for the fireman, and also the clearance limit of permanent structures. Then the testing plant at Purdue came to the front and brought out certain points on boiler performance well worthy of attention. We were shown the intimate relationship existing between all of the elements of the boiler and the fuel, and how a change in any one affects the economical operation of the whole. As the draft rises so does the firebox and smokebox temperature, and with this the amount of fuel burned per hour; facts more or less well known, but we did not know just what this relationship was until these reports were published. We can now see how the rate of evaporation falls off as the intensity of the combustion increases, and we are thus able to form an approximate estimate of the values to be obtained from forcing, and their probable cost.

We have been taught, too, a really scientific method of handling the indicator and interpreting its records, and we are shown how a bad adjustment of piping may tell a falsehood under a guise of truth that is worse than misleading, and how many of the conclusions that have been drawn from indicator cards that looked all right may be misleading and not warranted by the actual conditions that exist within the cylinder. The conclusions reached from a study of the indicator work done in connection with the plant are that piping tends to retard the pencil action and that it should, therefore, be short and direct, and that this piping effect increases with the speed of the engine and inversely with the point of cut-off.

A great deal of valuable information has also been obtained regarding the proportions of valves and the effect of lap, lead, travel and inside clearance. In the days when the valve-setter shrouded his work in mystery lead was usually fixed by the arbitrary decision of some one in charge based upon an opinion that had more or less, usually less, of a foundation to rest upon; and inside clearance never existed except where some careless workman had planed out the D of the valve too much. As for the increasing lead that occurs with the shortening of the cut-off with the Stephenson gear, there were two opposing camps, with diametrically opposite opinions: one holding that the increase was good and an advantage and the other the reverse; each having very good reasons for its belief. Hence the careful analysis of these matters that we now have is welcome as a fair referee's decision of a disputed point. It appears that a reduction of lead effects a reduction in the back-pressure losses, but it also reduces the positive work under the steam and expansion lines; and, judging from the cards alone, it would appear to be a fair question whether any advantage had been gained by reducing the lead; but it must be remembered that a reduction in the size of a card does not necessarily constitute an argument against reduced lead. The advisability of the change is rather to be judged by the amount of steam consumed per unit of power. And then it is shown definitely and "conclusively, that the reduction in lead effects a reduction in the amount of steam consumed." This has led to a strengthening of the position of the Walschaert gear with its constant lead as a valuable improvement to the American locomotive.

As for inside clearance, the blowing-through effect, that was formerly feared, has been shown to be "insignificant as far as its effect upon the form of the card is concerned, even though the amount of clearance is as much as ⅜ in." while the reduction of compression and the freer passage that is given for the exhaust steam to escape to the atmosphere, lowers the back pressure, increases the area of the card and with it the mean effective pressure. This, however, does not mean that there is a saving in steam consumption, for it appears, as would be expected, that "inside clearance results in loss of efficiency at low speeds, but as the speed is increased, the difference in steam consumption for different amounts of inside clearance diminishes" until at high speeds of "50 miles an hour or thereabouts, we have the same steam consumption for all cases. For speeds above 50 miles an hour, the least steam consumption attends the use of the greatest amount of inside clearance, while the steam consumption for the valve having no inside clearance increases rapidly, with increase of speed beyond this limit." All this has been checked off and corroborated by engines in high speed service, upon which it has been found to be necessary to use a liberal amount of inside clearance in order to obtain the required speed and tractive power.

So it runs, through a wide gamut, in the performance of the

locomotive, and we find that the sum of our knowledge has been vastly increased since the first days of the Purdue plant, and the generalizations that have been drawn regarding the action and interaction of the several parts are having their influence along the whole line of American practice. It is quite true that the specific conditions that may have exercised great influence on the engine used for the greater portion of this work, may not exist in others of different types and weights, but this will not necessarily vitiate the results. So that the broad generalizations that have been put forth regarding boiler, cylinder and engine performances, with the resultant drawbar pull and the losses that occur between the indicated and the actual work of the locomotive can be accepted as very nearly accurate.

New York Central & Hudson River.

The year 1906 will always stand out in the long history of the New York Central, as the year of the beginning of electric operation. On September 30 the first train operated by electricity ran into the Grand Central station. This was a trial trip, but on December 11 regular service with motor cars of the Yonkers local trains was begun between the Lexington avenue temporary terminal and the present terminal of electric operation on the Hudson division at High Bridge, being hauled thence by steam locomotive to Yonkers. At the same time switching by electric locomotives in the new depressed Lexington avenue yard was begun. Since the close of the year, with the exception of the New Haven trains, almost all trains running in and out of the Grand Central station have been changed over to electric operation either with motor cars or electric locomotives. The use of electric locomotives on the Harlem division began disastrously with the wreck of the Brewster local express on the evening of February 16, but the working of the electrified lines has been, with this exception, satisfactory, and has already caused a great saving in switching movements over the line as far north as Mott Haven Junction and, at the same time, improved the atmosphere in the Park avenue tunnel, which begins to give a hint of what it should be under complete electric operation. It is expected that operation of all regular trains by electricity between the temporary electric terminals at High Bridge and Wakefield will be shortly accomplished. For some months longer, however, it may be expected that the New Haven trains will be operated in and out of the Grand Central station with steam locomotives.

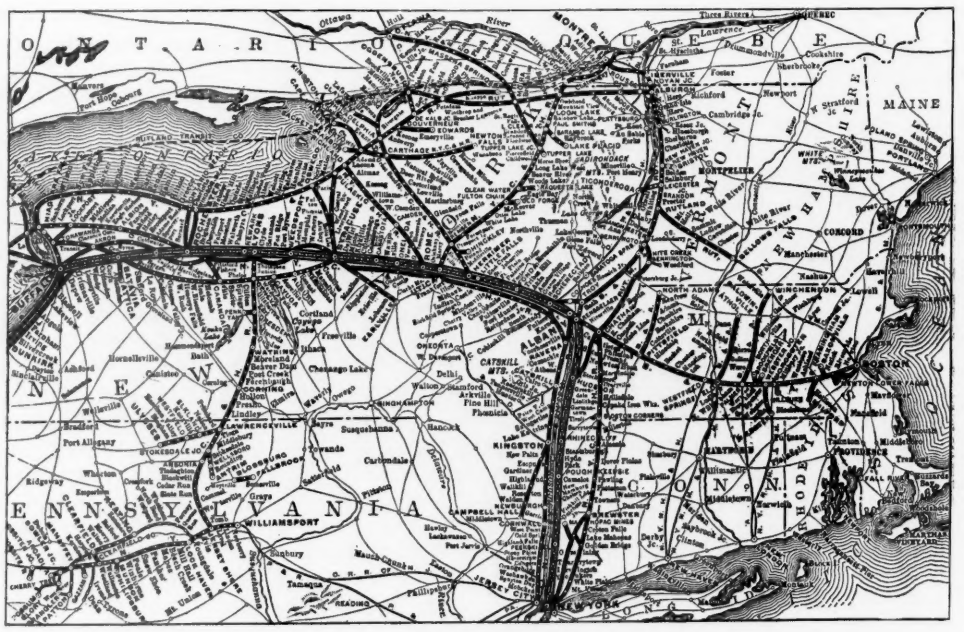
Of the work on the new and improved Grand Central station about one-third is finished. The great task of entirely rebuilding the terminal and station, which involves placing the express tracks on the level of the present depressed Lexington avenue yard and the local tracks on a still lower level, is being done in three sections; the first including the Lexington avenue temporary terminal and depressed yard; the second, the space between this and the eastern edge of the Grand Central station proper, containing the train shed for incoming trains which is now being torn down; and the third, the Grand Central station proper. The excavation on the first section is finished, so far as present conditions will allow, and is now under way on the second or middle section. By moving a large number of trains to the new temporary terminal on the east, it is possible to abandon this middle section while under construction without seriously overcrowding the Grand Central station proper. The cost of the Grand Central terminal improvement up to the end of 1906, as charged for the first time on the balance sheet, is a little more than $7,000,000.

In connection with the electrification there has been another year of changes and improvements to both the Hudson and Harlem divisions in the territory soon to be electrified. At Mott Haven Junction excavation is now under way for the large "Bronx" station there to be built. The four-tracking of the line between Spuyten Duyvil and Yonkers has advanced to the point where its completion awaits only the moving of a few large obstacles such as station buildings and bridges. Through Yonkers, where the four-track line is to run on an elevated viaduct on reinforced concrete abutments, thus doing away with all grade crossings, the work is well under way, $53,000 having been spent during 1906. Some of the most important four-track work in the neighborhood of Ossining is finished; $117,000 was spent during the year for station and yard improvements at this point. The piles are being driven for the foundations of a second double-track bridge over the Croton river. There was a total of $489,000 charged to cost of road and equipment during the year on account of this four-track work between Spuyten Duyvil and Croton. Besides this, $355,000 was charged to the same account for improvements in yard and terminal facilities at Croton where excavation and filling were carried on during almost the whole of the year for the new terminal yard and a large engine house and an inspection building for electric equipment built. This electric terminal is to be just north of the Croton river bridge, about one mile south of Croton.

Considered from the standpoint of earnings the year was a prosperous one, though increases were not as large as in the previous year. Gross earnings were $92,000,000 against $86,000,000 the year before, a gain of $6,000,000 against $7,500,000 in 1905. The increase in freight earnings was $2,500,000, only half that of 1905, but there was a gain in passenger earnings of $2,800,000 against $1,600,000 in 1905. The increase in net earnings was $1,000,000 against $2,100,000 in 1905. There was an increase of $2,400,000 in income from investments, the result of raising the dividend rates on Lake Shore, Michigan Central, and Pittsburg & Lake Erie stocks owned, and a gain of $1,800,000 in net income. Dividend payments were larger by $1,200,000, principally on account of the $45,900,000 new stock issued during the year and also because of the increase in the annual dividend rate from 5 to 6 per cent., which, however, was operative only in the last quarter of the year. The year's surplus after dividends was about $800,000 larger than in 1905. In both years this was used almost entirely in special appropriations. There was deducted for additional betterments made during the year $1,300,000 against $1,500,000 in 1905 and for the special improvement fund $2,800,000 as compared with $1,500,000 in 1905.

The freight earnings, and more particularly tonnage, were affected unfavorably by the heavy decrease in coal carried due to the four months' strike in the bituminous fields and "subsequent inability to concentrate the scattered car supply for coal movement." This loss of tonnage had less effect on earnings than it would otherwise have had because there was the largest movement of merchandise traffic ever known which in a way took the place of the coal and at the same time paid a higher rate. The tendency to make the New York Central more of a high grade and less of a low grade traffic road is hinted at in decreases in the tonnage of grain—once the principal traffic of the road—and lumber. On the other hand there was an increase in miscellaneous manufactured articles of 1,660,000 tons or 43 per cent. The decrease in bituminous coal tonnage was 1,270,000 tons, or 12 per cent. There was an increase of 4,900,000 revenue ton miles and a decrease of 102,000,000 ton miles of company freight, making a net decrease of 97,000,000 ton miles during the year.

The increase in passenger, mail and express earnings for the year amounted to nearly 11 per cent. One can get an idea of the importance of this department of the New York Central's traffic from the fact that passenger train mileage during the year was 27,000,000 miles against 24,600,000 traveled by freight engines. The gain in passenger earnings is remarkable in view of the poor service which was given in at least parts of the road's territory throughout most of the year. Partly the indirect result of the terminal electrification, but apparently much more due to disorganization of the operating and motive power forces, schedules to and from the Grand Central Station have been rarely lived up to, and frequently have entirely gone by the board. One particular cause of complaint during the past winter has been the condition of the steam locomotive power, which has at times been so run down that a drop of 15 or



New York Central & Hudson River.

Including the Rutland Railroad, results of whose operation are separately reported.

20 degrees in the temperature disorganized or tied up the operation of certain suburban divisions. Conditions at present are not as bad as they have been, but since a change of the schedule about a month ago by which the time of almost every train was lengthened from five to 15 minutes there appears to be no closer living up to schedule than before. It is not unheard of for a train never to be exactly on time at a certain station for six months or a year. From frequent observation of the condition of the road it seems obvious that much of the confusion and delay is the result of poor management.

Maintenance expenditures were in general somewhat higher than in the previous year. Maintenance of way cost $3,052 per mile of road as against $2,820 in 1905. Repairs of equipment, not including renewals, cost $2,038 per locomotive against $2,055 in 1905, $723 per passenger car against $617 in 1905 and $60 per freight car against $53 in 1905. Including renewals the figures were per locomotive $2,693 against $2,561 in 1905, per passenger car $788 against $643 in 1905 and per freight car $77 against $80 in 1905.

There were bought during the year $6,000,000 of the $10,000,000 new capital stock of the Mohawk Valley Company, maintaining the New York Central's ownership of 60 per cent. of the stock of this holding company for electric lines between Buffalo and Albany; $241,696 of the $250,000 stock of the Little Falls & Dolgeville, an 11-mile branch from the main line, formerly independent; $12,800 of the stock of the Merchants' Despatch Transportation Company, an incorporated fast freight line which handles much of the highest class traffic over the New York Central lines; and $574,800 Boston & Maine common stock. In regard to the Merchants' Despatch Company information as to the terms under which traffic is handled by it over the New York Central would be much more illuminating to the shareholders of the railroad than the facts in regard to a small purchase of capital stock. The Boston & Maine purchase may or may not be significant. It seems probable that that road cannot always remain permanently independent and must come into possession of either the New York Central or the New York, New Haven & Hartford. Even in the latter event the New York Central, which already through the American Express Company controls a substantial interest in the Boston & Maine, would have an incentive to first make its control as strong as possible in order to demand from the New Haven certain advantages, such as perhaps the surrender by that road of the New York, Ontario & Western in return for its acquiescence in the New Haven absorption of the Boston & Maine.

One great problem which the New York Central more than a great many other roads is facing, which is no doubt responsible for many of its difficulties, particularly the great delays to freight during the past year, is the fact that its traffic has been and still is increasing at an unprecedented rate. The road has a rough measure of work done in the number of cars handled daily. In the first 15 days of April there were 108,000 more cars handled than in the same period of 1905 and of this number 73,000 were loaded cars. The New York Central is better situated than many roads at the present moment to handle so large a traffic, for it has at hand the proceeds of $50,000,000 short term notes sold in January, but at the same time it has the heavy expenses of the improvements in the New York terminal territory.

The principal statistics of operation, rearranged according to our usual classification, were as follows:

	1906.	1905.
Mileage worked	3,784	3,774
Freight earnings	$54,824,282	$53,312,331
Passenger earnings	28,568,778	25,761,386
Gross earnings	92,089,768	86,095,602
Maint. way and structures	10,718,599	9,984,101
Maint. of equipment	14,569,057	13,238,124
Conducting transportation	37,267,589	34,360,220
Operating expenses	64,953,695	59,968,028
Net earnings	27,136,073	26,127,573
Other income	7,707,738	6,523,499
Gross income	34,843,811	32,651,072
Net income	12,275,907	10,258,570
Dividends	7,832,885	6,612,500
Appropriated for betterments	4,108,261	3,032,722
Year's surplus	19,434	18,252

NEW PUBLICATIONS.

Locomotive Performance. By William F. M. Goss, M. S. D. E. New York: John Wiley & Sons; London, Chapman & Hall. 439 pages, 229 illustrations; 6 in. x 9 in. Cloth. Price, $5.00.

With the publication of this book it is the expected that has happened. Those conversant with railroad work, and the development of the locomotive have kept more or less in touch with what has been done in the locomotive experimental laboratory at Purdue University. The work has been going on quietly and effectively for 16 years, and as the results have been established they have been given to the public through papers read before the several railroad associations of the country and the technical press. So gradually have these been brought out, that few have realized what a tremendous mass of valuable information had been gathered until the publication of this book. Each separate item has been received with interest, has been commented upon, at the time of its publication, and then laid aside to be used as the exigencies of service or the requirements of the designer might demand. In this way the information has been scattered through such a wide range of publications and over such a great extent of time that its true total value has escaped notice. This is, however, borne in on one as he turns the leaves of this small book, small in volume to be sure, but it is well within bounds to say that it contains more information regarding locomotive performance than any book or books that have heretofore appeared. In short, it is probably the most valuable treatise on the subject that has ever been written, and it is difficult to find words to describe it at its full worth. Aside from the intrinsic value of the subject matter, the method of its presentation is admirable in the extreme. The style is fluent, easy, clear, definite, absolutely free from diffuseness and is one of the best examples extant of concise and logical treatment of a subject. It is free from mathematical hypotheses and complications. It tells a straight, unvarnished story of what a locomotive did under certain definite conditions. These conditions were repeated often enough so that there could be no doubt that the story was a true one, and then deductions are drawn that no one can question. It puts the reader into close personal touch with and breathes the atmosphere of the Purdue laboratory, and he feels the honesty and integrity with which all of these investigations were pursued.

The book opens with a brief review of the Purdue testing plant, and the method of installing the first and second locomotives. The construction of the testing apparatus is described in such detail that the interested engineer is in a position to judge for himself of the probable value of the records. The methods of conducting the tests are laid bare and every means is given to permit a judgment to be passed upon every step that has been taken. The growth in the value attached to locomotive testing is detailed, and complete specifications are given of the locomotives used. Having thus shown how the work was done the data and results are given in the chapters that follow. The boiler, the firebox, the smokebox, the cylinders, the counterbalance, the valves, the gearing and the wheels are all studied and what they do and what they can be made to do told simply and directly. Nothing is taken for granted, and wherever there is a doubt regarding the conclusions to be drawn, no one can be more conscious of it or more anxious to point it out than the author.

In another column there is given a general review of what the Purdue plant has taught us. Such a review can only show it in the barest and faintest outline, for the only way to do justice to the book is to reprint it entire. It may only be added here that it covers the subjects of boiler performance and the effects of high rates of combustion and the thickness of the fire. It details the well-known smokebox investigations with the radiation and spark losses. It handles in a comprehensive way the use of the indicator and the effects of such valve adjustments as variations of lap, lead and inside clearance. It repeats the counterbalance tests that aroused such wide interest at the time of their publication. It shows the effect on locomotive performance of throttling, high pressures, diameter of drivers and atmospheric resistances, and concludes with a generalization of locomotive performances.

That is what the body of the book tells. In the preface we find a cordial tribute to the president of Purdue, and to those engineers who assisted in the establishment of the plant, and as far as the text is concerned the reader is left to guess at the connection of the author with the enterprise. But those who have kept track of this work as it has progressed know very well who the guiding spirit has been, and it would be difficult to find a railroad man who does not have a full appreciation of what has been done and of the man who has done it, and who will not look forward with eager interest to future revised and enlarged editions of the work, for the whole story has not yet been learned or told; and who will not feel a sense of self-congratulation that Professor Goss has placed this mine of information at his service, a mine unequaled in richness by anything that has thus far been brought to light.

CONTRIBUTIONS

Superelevation.

Detroit, Mich., April 22, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In partial answer to your correspondent in your paper of April 19: The sketches herewith are designed to represent graphically the conditions that seem to exist on an inclined plane.

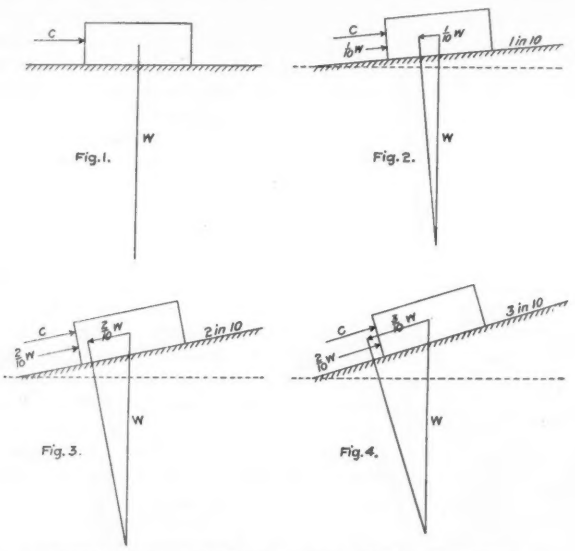
In Fig. 1 the plane is level and the load is vertical; hence there is no horizontal component of the load; and if we apply a horizontal force C it will exert its full value as a shearing force along the horizontal plane of contact.

In Fig. 2 the plane is inclined to a grade of one in ten, substantially the same as 6 in. superelevation on a railroad. In this case a force one-tenth W, parallel with the incline, is generated, and if not opposed by something the weight would move down the

incline. As it does not so move we say that a counterforce (friction) just equal to but no more than one-tenth W is generated. Since these two forces are equal and opposite in direction they neutralize each other, and any other applied force C exerts its full value as in Fig. 1.

In Fig. 3 the plane is inclined to a grade of two in ten. In this case the force two-tenths W is generated, and if the weight still remains immovable, though just about in a condition to start, it is because the friction two-tenths W is generated. Being equal and in opposite direction these forces neutralize each other, and any applied force C exerts its full value as in Fig. 1 and Fig. 2.

In Fig. 4 the plane is inclined to a grade of three in ten. Here we have a force three-tenths W tending to move the weight down the incline, and if the coefficient of friction is only two-tenths, then the friction cannot be greater than two-tenths of W; and we have therefore a surplus and unneutralized force one-tenth W tending to move the weight down the incline; and the net effect of an



Conditions Existing on an Inclined Plane.

outside force C will be diminished by this excess force one-tenth W. These four sketches indicate with sufficient accuracy some of the conditions to be found on a railroad track.

If C be taken to represent the centrifugal force, meaning a radial force generated by a weight moving in the arc of a circle and not complicated with other conditions, we see that its value is not affected by any superelevation of less than 12 in. (an inclination of two in ten); but that if we exceed 12 in. of superelevation then we just begin to get some relief, and if we take a superelevation of 18 in. we shall relieve the centrifugal force by an amount equal to one-tenth W, which is just the amount of relief we have always supposed we were getting from 6 in. of superelevation.

That this rather remarkable difference is due to our neglect to take friction into account will perhaps be evident if we refer again to Fig. 2, where we see that if we leave out the friction we shall have remaining a relief force of one-tenth W (about 200 lbs. per ton) to "balance" by so much the centrifugal force generated.

It seems reasonable therefore to conclude that superelevation within any limits that are practicable to use does not relieve or affect the centrifugal force; and it almost seems evident that it does not materially affect any of the other forces developed on a railroad curve.

JOHN A. FULTON.

Continuous Rails for Uniform Track Structure.

Montreal, April 29, 1907.

To the Editor of the Railroad Gazette:

With reference to the editorial on continuous rails for uniform track structure in your issue of April 12, 1907, you state that it is the lack of stiffness in the upper structure that permits the excessive deflecting of the ties, rather than the lack of bearing under the ties that permits the excessive deflection of the rail. I submit that the primary cause of low joints is the impact upon the rail ends of passing wheels, and that this cause is not eliminated by any practical form of joint.

I agree that present research and ingenuity seems to be exerted upon wrong lines, viz., in an endeavor to design a joint in which it is expected that the joint ties will not become low, instead of accepting primarily the necessity of proper maintenance of track. I concur in your description of an ideal joint, but I maintain that the bolt connection of a joint designed to provide for expansion and contraction is the limiting factor of strength rather than the section of the bars at the rail ends, and believe that the extra material added to the ordinary angle bar in the way of a depending flange is not only wasted but is objectionable. The Canadian Pacific Railway has had six to eight years of experience with about 1,000 miles of track so equipped, and has found that the depending flange causes ice to form between the ballast and the base of the rail, which, near the end of the season, forms a perfect anvil of ice on which the rail ends are battered. These bars were of soft steel, as you recommend, which the harder rail had worn or pounded down at the center, and the rail ends deflected similarly under the passing loads and caused a permanent low joint.

It was this wearing of the angle bar that suggested the increasing of the hardness of the bars equal to that of the rail, and, as this also increased the stiffness, the common angle bar of high carbon steel was finally adopted some five years ago. Our experience to date has been that we made no mistake, wear between rail and bars has been minimized, and, for some 3,000 miles of track so equipped only 48 bars have been reported defective, and these joints are holding up better than those with the depending flange, which I think goes against your conclusion for northern transcontinental railroads. In conclusion, I would point out that the old fish plate joint, properly maintained, is better than any of the modern joints where the maintenance of the surface at the joint is neglected.

F. P. GUTELIUS,
Assistant Chief Engineer, Canadian Pacific Railway.

Higher Pay in Prussia.

In reply to demands for higher pay and other concessions to the railroad employees, the Prussian Minister of Public Works said in the Diet that such questions necessarily engaged his attention, as he is the greatest employer of labor in the country. In 1900 his department paid on the average 68.8 cents per day; in 1907, as estimated, the average will be 73 cents per day. Now every additional cent per day means $866,650 more per year to be paid out. The advances from 1905 to 1907 in the pay and allowances of the regular corps of employees and of laborers absorbed 17 out of 40 millions of marks increase in amount paid for salaries and wages, the other 23 millions being due to an increase in the number of employees. The average pay of a workman, which was $189 in 1897, will be something more than $238 in 1907, an increase of more than one-fourth. The state is compelled to have regard to the condition of agriculture and other industries in advancing wages, and to follow rather than lead, especially as the state employees have advantages of security and privileges such as pensions, greater than private industries offer.

Pennsylvania Report on Motor Cars.

The following extracts are taken from the report to the General Manager by the special Pennsylvania committee appointed to study the operation of foreign road and rail motor cars.

Your committee left New York, Saturday, November 24, 1906, and returned to New York, Saturday, February 2, 1907. During the 10 weeks intervening, we inspected and traveled over the principal railroads of England, Ireland, Scotland, Belgium, Holland, Germany, Switzerland, Italy and France, thereby obtaining valuable experience and collecting voluminous data.

RAIL AND ROAD MOTORS.

The English railroads have operated rail and road motors for the past three years, using them as feeders, and in providing more frequent and satisfactory service on branch lines having light traffic, but principally as a defensive measure from tram or trolley competition. They have no objection to the building of lateral trolley lines, but are seriously opposed to competing tramways which would parallel their lines or affect their local business, as this short haul passenger traffic forms a large proportion of their passenger revenue, and they, therefore, jealously resent any encroachment upon their local territory. There was considerable demand for the introduction of tramways in England several years ago, but since the establishment of rail and road motor service the agitation for tramways has apparently ceased and a number of projected lines abandoned. This has been the experience along the Great Western Railway of England, the largest users of rail and road motors, as well as that of the London & North Western and the London & South Western Railways.

ROAD MOTORS.

The road motor for passenger service is simply an automobile omnibus of various types, the cost varying from $3,000 to $5,000, some of them having double decks, and in many cases a small compartment for the accommodation of luggage and parcels. Machines of this character have been introduced to a greater or less extent by the following railroads: London & North Western, Great Western, London and South Western, Great Eastern, Caledonian.

Frequent road motor service has been established at points where there are villages not located on the railroads, but with sufficient population to warrant the service, also from a station on the main line across country to the terminus of a branch line, as well as from the terminus of one branch line to that of another. These motors are operated, on advertised schedules, at a maximum

speed of 15 miles per hour, the average speed amounting to eight miles per hour. They make connection with the arriving and departing steam trains, preference being given at all times to departing rather than arriving trains, and stops are made at any point except on steep grades to receive or discharge passengers. The routes covered range from three to 20 miles in length, and the tariff rates for passengers, luggage and parcels are published, no distinction being made as to class. A store-keeper in each village is employed as the agent for the company, who receives and delivers parcels on a commission basis, the guard in charge of each motor issuing tickets and collecting fares.

The well-kept and excellent condition of the roads and highways in Great Britain, together with the moderate climate, make it practicable to operate this character of service successfully in country and suburban districts, where it would be absolutely impracticable, except to a very limited degree, in the territory contiguous to our lines.

In many cases where this service has been introduced, it has displaced the expensive, irregular and unsatisfactory facilities formerly provided by horse omnibuses and other conveyances operated by private individuals.

The established schedules are maintained with a fair degree of regularity and the service well patronized and apparently appreciated by those depending upon it. However, your committee failed to find, at any of the places visited, very much enthusiasm expressed in regard to the road motor proposition from a railroad standpoint, some of the railroad officials stating that they did not consider this character of service as a proper function of a steam railroad company, and in some cases negotiations were under way with independent automobile omnibus companies to take over and operate their road motor service; and further, we failed to find any road motors in operation or contemplated in connection with any of the Continental railroads.

We observed the performance of road motors of the London & North Western Railway in operation between Harrow and Watford stations, suburbs 11 and 17 miles from London, covering a distance of seven miles, describing an arc, passing through several towns and villages not located on the railroad; which, in addition to accommodating passengers arriving and departing on the steam trains, are also utilized to a considerable extent locally between the different villages.

The road motor is equipped with a four-cylinder gasolene engine, the wheels being fitted with flat solid rubber tires. There is a small compartment for luggage or parcels, and a passenger compartment accommodating 12 persons inside and seats for 18 persons on top; total capacity of 30 persons.

This line was inaugurated in July, 1906, and we were advised that the total cost of operation, including 20 per cent. depreciation, is one shilling per mile. The London & North Western has also a similar line in North Wales.

The Great Western Railway of England, on account of the numerous small towns and villages adjacent to the line, is the largest user of road motors, owning 84 machines and operating them on 44 established lines. We inspected the service between Slough and Stoke-Poges, a distance of 10 miles the round trip. The car used was equipped with a four-cylinder gasolene engine of the Milnes-Daimler type, and had a capacity of 20 persons, with a rail around the roof to permit the carriage of luggage on the top. The car had been in service for three years and presented a very good appearance. It was lighted with acetylene gas but not heated. There was no objectionable vibration while the car was running, and the average speed was about 10 miles per hour. Steam road motors have been tried on this line, but were unsuccessful on account of boiler troubles and have been abandoned.

The London & South Western has four steam road motors of the Clarkson type which are considered quite unsatisfactory.

The Great Eastern has 18 road motors; four Daimler, two Wolseley, two Thornycraft and 10 built by themselves. We inspected the cars in service at Chelmsford, where the service was established in March, 1905. These cars are equipped with four-cylinder 35 h.p. gasolene engines, chain drive, maximum speed 12 miles per hour, with flat solid rubber tires. The cars have double decks and seat 20 persons inside and 18 on top; total, 38. This car, while built at the company's shops, is of the Milnes-Daimler pattern with slight modifications.

The Caledonian Railway, Scotland, has two road motors in service a few miles from Glasgow, between Clarkston and Eaglesham, a distance of eight miles. They are not enclosed; one using oil fuel with steam generator, of the Serpollet type, and the other a four-cylinder gasolene car of the Durham-Churchill type, having been in service but a short time and being used experimentally.

It was noted that wherever steam has been used for the operation of road motors, they have proven unsatisfactory, and that the gasolene machines are the most successfully operated, those of the Milnes-Daimler type predominating.

From our personal observation and the information obtained as to the conditions existing under which road motor service has been established and operated in Great Britain, and with our knowledge of the general conditions existing in the territory traversed by our line, it is the opinion of your committee that the establishment of this character of service as an adjunct to our railroad passenger business is not worthy of any serious consideration at this time, and it is our judgment that the same cannot be successfully or profitably operated on account of the general bad condition of the roads, severe climate, and the territory not at present covered by trolley lines being so sparsely settled as to make such service unnecessary and unwarranted.

RAIL MOTORS.

Rail motors, costing from $8,000 to $10,000 each, have been introduced to a greater or less extent by all principal railroads of England; also by a number on the Continent, as follows:

Great Western Railway,
London & North Western Railway.
London, Brighton & South Coast Railway.
London & South Western Railway.
Great Central Railway of England.
German Government Railways (Saxony).
Italian State Railways.
Paris, Lyons & Mediterranean Railway.
Paris & Orleans Railway Company.

More frequent and prompt service, economy of operation, and the forestalling of tram competition, also in some cases to lessen the stops of express trains (the motor cars accommodating the travel between intermediate stations), are the reasons given for establishing this character of service.

In some cases these rail motors have entirely displaced the steam passenger service on branch lines, but are generally being used for supplementary service in connection with other trains.

The English railroads, under Board of Trade regulations, are compelled to provide fully equipped stations at all regular stops of their steam trains, consisting of a permanent structure, heated and lighted, with raised platforms, one and generally two booking offices, toilet rooms and waiting rooms, for the separate accommodation of the several classes of travel, together with a complete staff of attendants, which is a proposition involving considerably more expense than is the case on American railroads. In the operation of rail motor service, however, they are excused from these regulations and are permitted to establish regular stops, which are called "Halts," without any accommodations or conveniences for passengers other than a low platform, in some cases with, but in many cases without a shed or shelter, under which permission it has been found desirable to establish a great many more stops for the motor cars than for the regular steam trains, making it more convenient for the patrons of the road and thereby stimulating travel without any additional cost for station maintenance or operation.

Practically the same regulations regarding rates, tickets, etc., governing regular steam trains apply to this service, with the exception that no luggage or parcels are delivered at "Halts" and no class distinction is made as to passengers.

The car is in charge of a guard who issues tickets and collects fares, also performs the necessary duties in connection with the handling of luggage and parcels and keeps the necessary train records, his rate of pay being somewhat higher than that paid the guard on a regular train. Generally a driver and a fireman are also employed in the operation of the car, receiving the same rate as that paid to the driver and fireman on a regular locomotive, making the crew consist of three men. In some cases, however, the fireman is dispensed with, the driver performing his duties, making the crew consist of two men.

The car is equipped with a small compartment on the rear platform in which is placed a throttle connection with the boiler, the necessary brake apparatus and whistle, which permits it to be operated from either end, making it unnecessary at any time to turn the car.

The design and construction of the car is such as to make it unsuitable for shifting purposes, and, therefore, this is not attempted or allowed, such service when necessary being performed by a shifting locomotive or horses, the latter being used to a great extent at all points, even to take cars (capacity 10 tons) to and from the main track. On such lines where motor cars are operated, the freight train service is performed by a regular locomotive.

From our observation the acceleration of these cars was more rapid than on regular trains, the maximum speed not exceeding 50 miles per hour.

From the information given us, it would appear that where rail motor service has been established travel has increased to a considerable extent. Within itself, the service is not remunerative, but the expense would seem to be warranted when its value as a feeder in creating additional long-distance travel for the main line steam trains is taken into consideration. We were, however, unable to obtain any statistics to confirm this statement.

The operating officials of the various roads on which this character of service has been established were rather enthusiastic as to the possibilities of the same. The mechanical people, however, were practically unanimous in expressing themselves as not being favorable to the self-contained rail motor and its ultimate economy.

While it is admitted that there is a slight saving in fuel, it is claimed that this is more than offset by the increased cost of maintenance and the loss of service while undergoing repairs, experience so far demonstrating that the self-contained motor car requires more frequent shopping than the ordinary locomotive and coach, on which account the London & North Western and the London & South Western companies have found it necessary to design and are now building the engine on an independent frame fastened to the frame of the car, which can readily be detached and an extra engine substituted, facilitating repairs and reducing the time in shop.

On the Continent, while this service is in actual operation to a limited extent in Germany, France and Italy, the railroad people still consider it to be in an experimental stage. They, however, are operating this class of service with a crew of two men, namely, driver and guard. It is necessary to turn these cars at terminals on account of their not being equipped to permit of their operation from either end.

We inspected the Great Western Railway motor service from Southall to Ealing, both stations being suburban to London. The car was about 60 ft. long, operated by steam, having outside cylinders, arranged with the boiler and engine compartment in the forward end, a small luggage compartment and a passenger compartment seating 50 persons, partitioned off to provide a section for smoking and the remainder for general travel. The rear platform was an enclosed compartment fitted with lever leading to throttle on boiler, also vacuum brake apparatus and whistle, making it possible to operate the car in either direction without turning.

The crew consisted of engineer or driver, a fireman and a conductor or guard who also handled the parcels and luggage as well as issuing tickets and collecting fares.

The speed ranged from 20 to 45 miles per hour, and the driver stated that the car was capable of 50 miles per hour. The car ran smoothly, without noticeable vibration, and had been in successful operation for three years. The estimated cost of operation was given us as 18 cents per mile.

The London & North Western operates a rail motor line on its Oxford branch from Bicester to Oxford. Upon our arrival at Bicester, where we went to inspect this car, we found that it was in the shop at Oxford undergoing slight repairs and the run was temporarily filled by a steam train, which we used to Oxford, and had the opportunity of inspecting the car in the shed. This car was operated by steam, equipped with upright boiler, inside cylinders and crank axles.

The car was divided into boiler and engine room, luggage compartment, smoking compartment seating 24 persons, and one general compartment seating 24. The crew consisted of three persons, engineer or driver, fireman, and conductor or guard. The car was fitted to be operated from either end without turning.

We were informed that this particular line had been operated 15 months, at a loss of $350, but when the entire rail motor service of the London & North Western was taken together it was $3,500 ahead on the year's business. The cost of operation, including depreciation, was placed at 13 cents per mile.

The London, Brighton & South Coast has two gasolene motors in service at Brighton, which we inspected. Each car is equipped with two 30 h.p. Daimler motors suspended from the frame. Length of car 48 ft., capacity 42 passengers. The service was inaugurated in March, 1945. The longest continuous service for these cars without repairs has been two months. These cars were both in the hands of the mechanics undergoing slight repairs, but were expected to be properly repaired in time for their next scheduled run. The crew consisted of driver and conductor or guard.

There was considerable noise and vibration noticeable while these cars were standing with the motors running, as well as a very disagreeable odor from the gasolene.

The London, Brighton & South Coast has also two small detachable steam locomotives at Brighton which are attached to trailers. These trailers are fitted with shaft extending under or over the car to throttle valve so that the locomotive and trailer may be operated from either end without turning. We were informed by the local officials on the ground that the latter service was more satisfactory than the cars operated by the gasolene engines, although necessitating an additional man (fireman).

The London & South Western has 14 steam rail motors similar to those mentioned above, each car being operated by two men, a driver and guard, who alternate their positions weekly.

The Great Central Railway operates two rail motors from its Marylebone station, London, of a similar type to those in use on the London & South Western.

The German railroads, under Government management, have been experimenting with rail motors for two years, using for purposes of comparison a Serpollet car (steam, with coal fuel), a Milnes-Daimler car (gasolene), and an accumulator car (storage battery), also a small locomotive and coach. We were informed that the experiment so far showed the steam locomotive and coach to be the most economical and successful in operation, and a statement showing the results of the trials was furnished us and is submitted.

In Italy we learned that some experiments had recently been conducted at Milan with steam rail motor cars, but as the tests had been completed and the cars removed, we were unable to inspect them. We wrote for the result of the experiments, but have not yet received the information.

In Berlin, the American Consul, Mr. Thackara, had recently been investigating the subject of rail motor cars, and kindly furnished us with full data and photographs concerning the Ganz rail motor (steam), which accompany our report, these cars we understand being in use on the Austrian State Railways.

In correspondence with the manufacturers as to where these cars could be seen in operation, we learned that they had recently established an American agency with the Railway Auto Car Company, No. 114 Liberty street, New York City, which states that one car is about to be placed in operation on the Florida East Coast Railway and that three cars are now contracted for, one for service on the Erie Railroad, which will be run in about 30 days; one for the Rock Island System, which they expect to have in operation about June 1, 1907, and another for the Delaware, Lackawanna & Western, which will not be completed until next fall.

In France, the Paris, Lyons & Mediterranean Railway has eight steam rail motors, six of them built by Purrey & Company, Bordeaux, and two Serpollet cars.

The service was inaugurated about three years ago, but has only been in full operation about a year. The Paris, Lyons & Mediterranean people are building 12 more of these cars, but state that they are still in an experimental stage; and that the motors are frequently out of order, perhaps 50 per cent. of the time, and that the service thus far cannot be considered satisfactory.

The Paris & Orleans Railway has 10 rail motors, built by Purrey & Company, Bordeaux. The service was first introduced two years ago, but has been in full operation only six months. These people could not furnish ready figures showing the cost of operation and results obtained, the service so far being entirely experimental, but apparently they did not seem to approve of the proposition.

The English railroads, by the introduction and operation of self-contained rail motor cars, have apparently accomplished the purpose intended, by increasing travel, effecting a saving in operation, in that they use in some cases a crew of but two men and never more than three, also a saving in station force and a slight economy in fuel, which results could only be accomplished or brought about with the conditions confronting them, by the substitution of the self-contained motor car for the regular steam service, and have further eliminated to a great extent the several class distinctions of passenger travel which custom requires them to maintain in their regular steam service. In this class of service they evidently have the most effective answer to tram competition.

With the benefit of this experience, your committee is of the opinion that the installation of self-contained motor cars for passenger service on certain branch lines largely depends upon the gradients, the possibilities for increased travel, and the saving which it is possible to obtain in operation by a reduction in the number of men comprising the present train crew. If the latter is possible to the extent of one man, your committee believes that the question is worthy of serious consideration.

A small tank locomotive and car equipped for operation in either direction without turning, commends itself as the most elastic adaptation of the rail motor which came under our observation, and appears to be in the line of future development abroad.

The Railroad Commission of New Jersey.

The Act creating the Board of Railroad Commissioners for the state of New Jersey, which has just become a law, empowers the Governor, with the advice and consent of the Senate, to appoint three citizens of the state, not over 30 years of age, to terms of six years each beginning May 1; but it is arranged that the terms shall expire successively in 1909, 1911 and 1913, etc. The salaries of the commissioners are to be $5,000 each and that of the secretary is to be $3,000. The board is to appoint two inspectors, one of whom shall be a civil engineer, skilled in railroad affairs, and the other a mechanical or electrical expert; also other necessary clerical and expert help; but the total expense of the board, including salaries, must not exceed $30,000 a year. The board is to have general supervision of all railroads, by whatever power operated, which are subject to the general railroad act of 1903. The board may require the attendance of witnesses and the production of papers and may invoke the aid of a Justice of the Supreme Court in these matters. Every railroad must report all accidents immediately to the commission and, if the public interests require it, the commission shall investigate the accident. The board is to hear all complaints touching railroad service, etc., applications for connecting tracks, for changes of stations, for abolition of crossings and all other matters of railroad operation. It is the duty of the board to see that the railroad laws are observed and enforced, and, through the Attorney-General, who is to be its adviser and legal counsel, may cause actions to be brought to recover penalties from railroads. The orders of the board concerning safety of road, etc., and concerning

station facilities, must be complied with by the railroads, or, upon their failure, the board shall report the facts to the Attorney-General; and he must proceed against the offending railroad. An aggrieved railroad may petition the Supreme Court. The commission may enter a suit in equity to enforce its orders.

New Railroad Laws of Indiana.

The Railroad Commission of Indiana has issued to the railroads of the state a circular giving in brief language the requirements of the several new laws affecting railroads which were passed by the legislature of that state, recently adjourned, and which went into effect April 10. This circular is in substance as follows:

Duties and Requirements, Section 3, Commission's Bill.—a. An annual report is required to be filed on or before October first, in the form prescribed by I. C. C. This does not apply to electric roads until 1908.

b. Steam lines required, as between themselves, to afford all reasonable facilities for the interchange of traffic at junction points; electric roads, as between themselves, the same.

c. The construction of sidings, switches, spurs and turnout tracks to industries is required, also connections with industrial tracks.

d. The construction of interchange tracks at all junction points is required, unless the commission orders to the contrary. This applies to crossings at, over or under grade.

e. Transportation must be completed without breaking bulk.

f. Switching must be done for connecting lines on arrival at junction points, and cars made empty must be returned to junction point upon demand.

g. Railroads shall not cross each other in this state without the approval of the commission. This does not apply to an electric road crossing a steam line under the act of 1903.

Tariffs, Section 9, Commission's Bill.—a. Requires all intrastate tariffs to be filed with the commission within 60 days after the act goes into effect.

b. Any interstate tariffs shall be filed within five days after being called for.

c. Tariffs to be in form as prescribed by Interstate Commerce Commission.

d. New tariffs to be filed two days before becoming effective, or the commission may, upon showing, permit new rates to go into effect at once. No change in rates to be made on less than 10 days' notice filed with commission.

e. All switching, transfer and terminal charges to be published and filed as tariffs.

f. All tariffs to be kept on file at all offices where an agent is regularly maintained.

g. No service shall be performed unless a tariff therefor is filed as required.

Passes, Section 13, Commission's Bill.—Free tickets, free passes, or free transportation for passengers, freight or express are forbidden under penalties, except to officers and employees. Does not apply to any pass legally issued for year 1907. This exception was only intended to cover passes issued by the interurban lines which were not subject to the old law.

Accidents, Section 19, Commission's Bill.—a. All accidents resulting in the loss of life or serious injury to passengers or employees to be reported to the commission within five days, with general cause thereof, and within 20 days a full report of the cause shall be filed with the commission.

b. Requires railroads to keep tracks, grades, engines, cars, depots and grounds in good condition and to manage and operate the road with reference to the security and accommodation of the public.

c. Requires that passenger trains be scheduled and operated so as to make reasonable and proper connections at junction points.

d. Provides for the separation of the grade of two crossing lines when both companies agree thereto.

e. Provides for proceedings before the commission to separate the grade of two or more crossing lines when one of the lines desires so to do.

Bribery by Officers, Employees and Patrons.—This act makes it a crime for an officer or employee to accept money or property in addition to regular charges for performing a service, or for patrons to give or offer to give money or property to an officer or employee to obtain service.

Car Movement, etc., Shippers' Bill.—a. Requires traffic to go forward an average of 50 miles every 24 hours. Twenty-four hours allowed for movement through terminals and junctions. Penalty $5 per car per day, or 25 per cent. of freight on L. C. L.

b. C. L. freight to be delivered in 24 hours after arrival, or 24 hours after delivery to connecting line. Penalty $5 per car per day.

c. Car equipment required and equitable distribution among shippers demanded.

d. Car service record required and demand for cars to be noted therein. Cars to be furnished in 48 hours after demand. Penalty $1 per car per day for failure to furnish. The commission will have the form for this record within the next two weeks. It is required to be at each station after 60 days from date the act becomes effective.

e. If coal is confiscated carrier must give immediate notice to consignor and consignee.

f. Lines initiating coal shipments must, on request, publish coal tariffs to any point in the state and furnish cars for shipment. When car of coal is given to connecting line it must go forward to destination and empty car be returned to junction point at an average of 50 miles per day. Penalty for failure $500 to $1,000.

g. Carriers can, only after obtaining permission of the commission so to do, charge less for hauling coal for manufacturing and steaming purposes than they charge for hauling domestic coal.

Safety Appliances.—(a.) Requires all locomotives and 75 per cent. of all cars in train to be properly equipped with brakes, etc. This does not apply to yard service or to a local train while switching. The commission is now of the opinion that the provisions of this act do not apply to work, construction or wreck trains. (b.) Automatic couplers required. (c.) Grab irons and hand holds required. (d.) Standard drawbars required. (e.) Provisions of this act apply to passenger traffic. (f.) Interurban cars used in passenger traffic required to have power air-brake. (g.) Overhead obstructions, less than 21 ft. from top of rail, are forbidden unless allowed by commission. Does not apply in cities or incorporated towns. (h.) No structure to be built, or rebuilt, which is less than 18 in. from the widest part of the widest locomotive or the widest car used on the line unless the commission gives permission so to do. Penalty for violation of paragraphs g and h $500.

Block System.—After July 1, 1909, it will be unlawful to operate trains over a line which is not protected by an approved block system. This applies to lines having a gross annual income of $7,500 or more per mile of line. The commission has authority to relieve carriers of this duty, as to branch or spur lines where traffic is not heavy, or on main lines where no necessity therefor is shown.

Train Rules and Regulations.—a. All companies are required to publish printed rules for the control of trains and to furnish copies thereof to all persons engaged in the operation of trains, and also file a copy with the commission. Employees engaged in the operation of trains shall be instructed in the rules and examined thereon at least once in each six months for 18 months after employment and then annually. Penalty not less than $25 nor more than $200.

b. Any officer, agent or employee of a company engaged in the operation of trains by steam power who is intoxicated while on duty, or who runs trains or gives orders to run trains in violation of the printed rules of the company or in violation of the laws of this state, is subject to a fine of not less than $25 nor more than $500.

c. Copies of this act must be posted in cabooses, depots, etc.

Transportation of Fish.—It is made unlawful to transport beyond the limits of Indiana any pike, pickerel, bass, * * * etc.

Hours of Service.—It is made unlawful to permit, exact, demand or require any engineer, fireman, conductor, brakeman, switchman, telegraph operator, or other employee engaged in the movement of passenger or freight trains or in switching service in yards of railroad stations to remain on duty more than 16 consecutive hours, except when caused by some casualty occurring after the employee has started on the trip, or to require or permit any employee who has been on duty 16 consecutive hours to go on duty without having at least eight hours off duty or to require or permit any such employee who has been on duty 16 hours in the aggregate in any 24 hours' period, to continue on duty or to go on duty without having had at least eight hours off duty within the 24 hour period. Penalty $100 to $500.

Full Crew.—This law requires all companies operating more than four freight trains in 24 hours to have a full crew on every train, consisting of 50 freight cars, excluding caboose and engine, and the full crew must consist of one conductor, one engineer, one fireman, two brakemen and one flagman. Freight trains of less than 50 cars and passenger trains must have the same crew, excepting that only one brakeman is required. Penalty $100 to $500.

Baggage Rates.—(a.) This act requires 150 lbs. of baggage to be carried with each passenger paying full fare, and 75 lbs. with each passenger paying half fare. (b.) The samples, goods, wares, appliances and catalogues of commercial travelers, or their employers, is declared to be baggage and is required to be carried as such. (c.) The charge for carrying baggage, in excess of the weights mentioned, is one cent for each three miles for each 100 lbs. of excess; minimum charge of 25 cents when baggage is less than 500 lbs. and 50 cents when it is over 500 lbs.

Passenger Rates.—By this act passenger rates are fixed at 2 cents per mile for the carriage of an adult. * * * If opportunity is furnished to purchase a ticket and a passenger fails so to do he may be charged 2½ cents per mile, but a check must be given entitling the passenger to receive the overcharge at any station of the company.

Liquor License.—Every company operating a dining or buffet car in which spirituous, vinous, malt or other intoxicating liquors are sold within the state, shall pay annually a license fee of $1,000.

Two laws, not referred to in the circular, are one approved February 21, declaring null and void any contract by which a railroad employee, in joining a relief association, surrenders his right of damage against the railroad company for personal injury or death; and one approved March 9, designed to allow a new railroad to alter the location of its line when necessary, and providing for the protection of land owners in such cases.

Electric Locking.

BY W. H. ARKENBURGH.

The old style interlocking plant, manually operated, with detector bars to prevent switches being thrown while a train was upon them was a great improvement over hand-thrown switches and a safety device of inestimable value. The only check on the manner in which the signalman handles his levers at such a plant is the "dog locking" and the detector bars.

The dog locking is designed and applied to an interlocking machine for the purpose of regulating the order in which levers shall be operated, in such a manner that those for the movements of switches, locks and signals of routes shall require those for the movements of similar functions in conflicting routes to be locked against being cleared. That is, in order to set the switches for a route, lock them and clear the signals for the passage of a train, the use of all opposite or conflicting routes must be prevented. This is all that can be provided for with mechanical locking. With moderate speed of trains and a high intelligence in signalmen, nothing more could be desired.

In late years speeds have been increased to an enormous extent, making it necessary to give distant indications farther and farther away, and power has been introduced to work the switches and signals. Increased speed means more space needed to stop in, and with the old style plant there is nothing to prevent the signalman from changing the route after a train has passed a distant signal at clear. This is a serious defect, for it might lead to running a train off a derail at high speed or through a sharp turnout with disastrous results.

Power used to operate the switches has frequently crumpled up detector bars under trains. Worse yet, with rail larger than the 85-lb. section, detector bars cannot any longer be counted upon to strike the tread of a wheel, but are quite liable to pass up outside. Thus a switch or derail can be thrown under a moving train, with consequences which can well be imagined. Lastly, detector bars are designed on a false principle; if they fail they are inoperative.

To overcome these difficulties electric locking has been introduced. Electric locking is merely an extension of the functions of the track circuit, and is sometimes called track circuit locking.

As applied to mechanical interlocking it is usually quite simple. It involves only the use of electric locks on the latches of certain levers, usually those of the home signals; though if the protection is to be made more complete, they are applied to certain special route levers or to regular levers that can be used as route levers.

The electric locks are electromagnets of such design that they act only when de-energized. When in this condition they hold the lever latch in such a way that the lever cannot be restored or moved either to its full normal or full reverse position, as the case may be.

Fig. 1 shows two views in section of one make of electric lock, applied to a Saxby & Farmer machine. D is the shaft, actuated by the lever latch, which drives the locking bars. On D is mounted a crank arm, which operates a link connection F. F is pinned at its upper end to segment A, which revolves on its center. A is notched to receive dog B, which falls by gravity into the position shown. E is an electromagnet which when energized lifts B out of the notch. When B is in the notch, A is locked and thus prevents the lever latch from being moved.

These locks are controlled by circuits passing through the points of track relays in the various sections involved. This control is usually accomplished through the medium of an indicator; that is, the track relays control the indicator, and the indicator controls the lock. This indicator is made on the principle of a relay, but at the same time actuates a miniature semaphore arm, showing "clear" when the indicator is energized and "danger" when de-energized. This is done in order to give a visible indication of the condition of the track section and not compel the signalman to depend upon watching the train or trying his levers. If he should pursue the latter course, he would be liable to put too much strain on the mechanism, or to catch the lock at the instant of releasing. Repeated trials will in time wear out the dog and slot of the lock and produce a dangerous condition, for it is possible to trip a worn dog and thus throw a lever that should be locked.

An indicator is shown in Fig. 3. Here X is a side elevation, Z

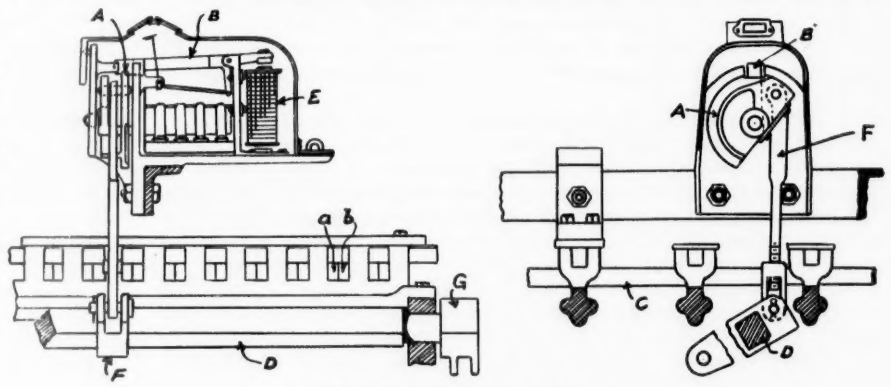


Fig. 1—Electric Lock.

a front elevation and Y is the same as Z, with front plate M removed. The magnet coils are shown at A. The armature B is pivoted at C and carries the contact fingers D, held in place by the insulating pins E. These fingers make contact at F, when the magnet is energized, and at G when de-energized. There are four of these fingers, and each will make either a front or a back contact. The bell is used to give an audible indication when the magnet is de-energized. Wires are attached at the binding posts H. I is the semaphore arm, pivoted at J on shaft K. K is actuated by armature B through rocker arm L, which is equipped with an alligator jaw at one end and a pin working in a slotted jaw on shaft K at the other end. M is a metal plate painted white and used as a background for arm J. The whole is mounted on a frame N, and contained in a case with a glass front.

The relative protection afforded by locking signal levers and route levers, respectively, may be understood by reference to Fig. 2, which shows the layout of an interlocking plant having a twenty-lever machine. If the latches of high home signals only are controlled by track circuits, protection only will be given to trains moving in the established direction of traffic on the high-speed routes. Suppose the switches set to make a route from A to B and a train in any part of the route. Then No. 17's latch is locked in the up position, and 17's lever cannot be put fully normal until the train has passed signal 4. No. 17 reversed locks No. 9 reversed,

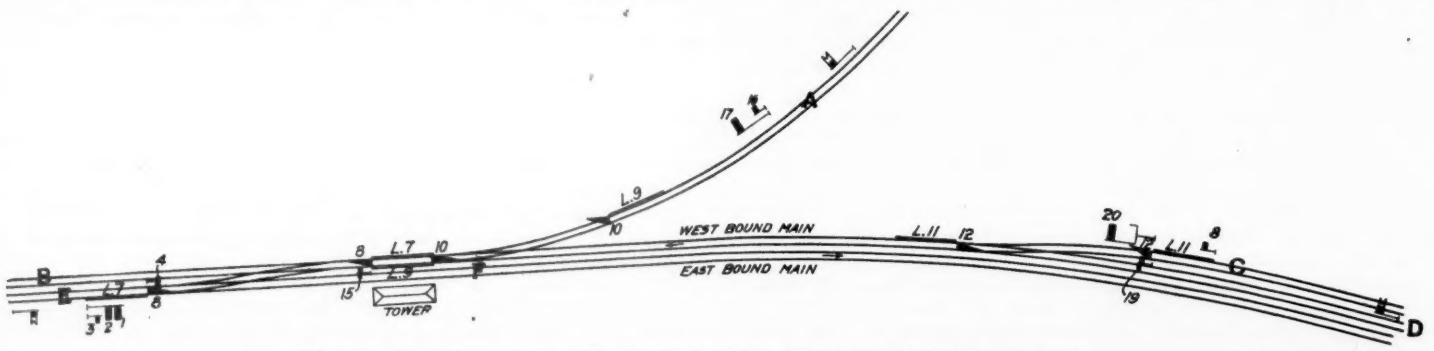


Fig. 2—Junction of Two-Track Main Line With Single-Track Branch.

which locks No. 10 reversed. No. 17 reversed also locks No. 7 reversed, which locks No. 8 normal; also Nos. 4 and 20 and 8 are locked normal; therefore, it is safe for the train to proceed, as none of the enumerated functions can be moved. But suppose the signals set for a movement from B to A. Now, No. 4 reversed will lock all the conflicting and opposing functions, but it has no lock on its latch, and track circuit protection is lacking. This could be overcome by putting locks on all the dwarf signal latches, but this would be too expensive. Again, if the signal were out of service and the signalman should flag a train through without reversing his signal lever, there would be no protection.

Full protection can be provided at minimum expense by choosing certain levers as route levers and locking their latches. There are the following possible routes in the present case: A-B, C-B, E-F, D-B, A-E, C-E, D-E, B-A, B-C, B-D, F-E, E-A, E-C, E-D. These may be so grouped together that from A to all possible points can be considered as one route; the same for E and B. Now, suppose

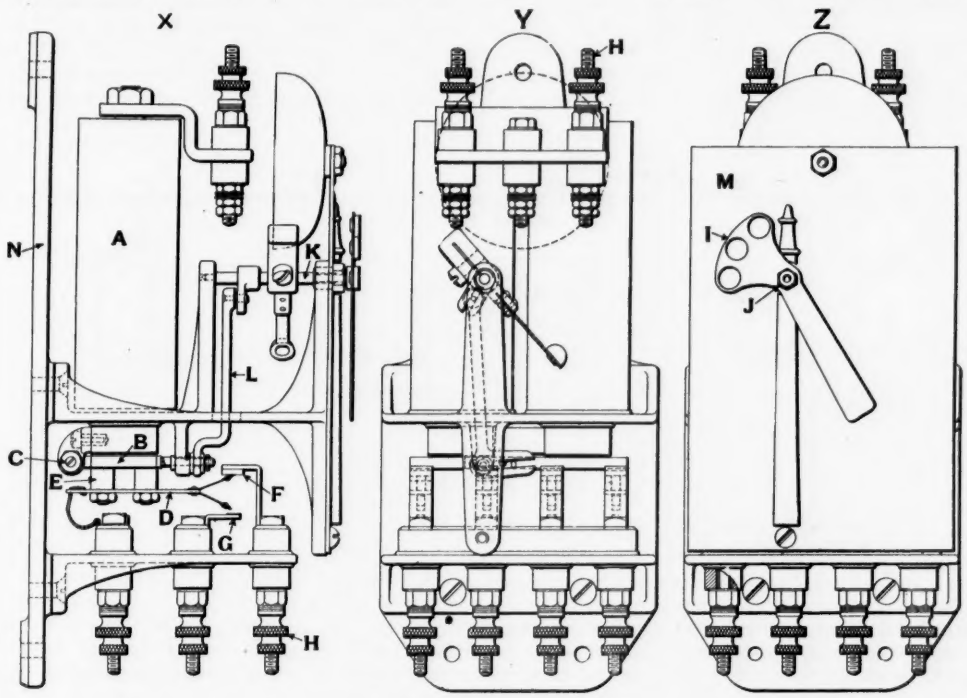


Fig. 3—Electric Indicator.

the dog locking arranged so that in setting up a route to or from A and B, No. 9 must be thrown last before the signal, and to or from E on the main line No. 7 must be thrown last before the signal. Then Nos. 9 or 7 reversed will lock all the functions in the route and will in turn be locked by the signal lever. Therefore, Nos. 9 and 7 are the only levers whose latches need be supplied with locks. These locks must lock the latch down with the lever reversed. This must be done every time a derail or lock lever is used as a route lever. Frequently when a switch lever is used as a route lever the lock must lock the latch down with the lever either normal or reversed. This must be done so as to render movement of the function impossible, while the lock is de-energized. In the case of a home signal lever this should not be done, because it should be always possible to put the signal normal to stop a train in case of emergency. When so supplied, complete protection against wrongful movements of switches and derails is afforded without reference to the home signal levers, no matter what route is being used.

Another method is to have the home signals locked reversed as soon as cleared, and released only when a train has reached a certain point within or beyond the interlocking limits. This will be discussed later in connection with approach locking.

At power plants with electric control the same methods as above described may be used; that is, levers may be locked direct. Usually there are no latches or latch locking at these plants, consequently the lever itself must be locked. Another difference is that there are usually no separately operated facing point locks at power plants. Therefore the locking must act on some derail or switch lever in the case of route locking. Also, these levers must be locked in the full normal or reverse position, as the case may be, for the reason described above in connection with mechanical interlocking. The disadvantage of this system is that there is no physical connection between the function and its lever, so that though the lever may be locked in one position, it is possible for the function to be in the opposite position. Also, control contacts may become detached, maliciously or otherwise, from the lever proper, and by working loose, or being moved through their stroke, cause false throwing of functions, although the lever is locked. It is almost impossible to produce a mischief-proof power interlocking machine.

A better method is to break the control or indication circuits of the various functions through points on the indicators or on relays controlled by them. It is the usual practice to break the indication circuits of the signals and the control circuits of the switches, derails, etc.

If the indication circuits of all signals are broken while a train is occupying the route or section of route governed, the protection will be complete. For, when the indication circuit is broken, the releasing device on the lever cannot act, and the lever is held in an intermediate position, thus locking all opposing and conflicting routes as if it were at full reverse. Usually, however, the indication circuits of the high home signals only and the control circuits of the switches and derails in a route are broken. This is done, because if, with no control on the switches, a signal should be out of order, and it were necessary to flag a train through, there would be no protection; this for the reason that there would be nothing to compel the signalman to reverse his signal lever, and with the signal lever normal the route would not be locked.

The principal disadvantage of using circuit control is this: A signalman may get his lever over and line up a new route by forcing or "plugging" his indication, although with this system functions cannot normally be falsely moved. This can be provided against by breaking the circuits of switches and derails in conflicting routes through the same relays. This is usually impracticable on account of complication, with consequent liability to failure, and also on account of the expense. The best system would seem to be a combination of lever locking and circuit control; that is, break the high home signal indication circuits and the switch and derail control circuits and lock route levers.

There is another system of so-called electric locking. In this, conflicting routes only are locked; that is to say, a train in a certain route locks switches and derails in conflicting routes only. This is no more nor less than dog locking is designed to do, and does with unexcelled efficiency.

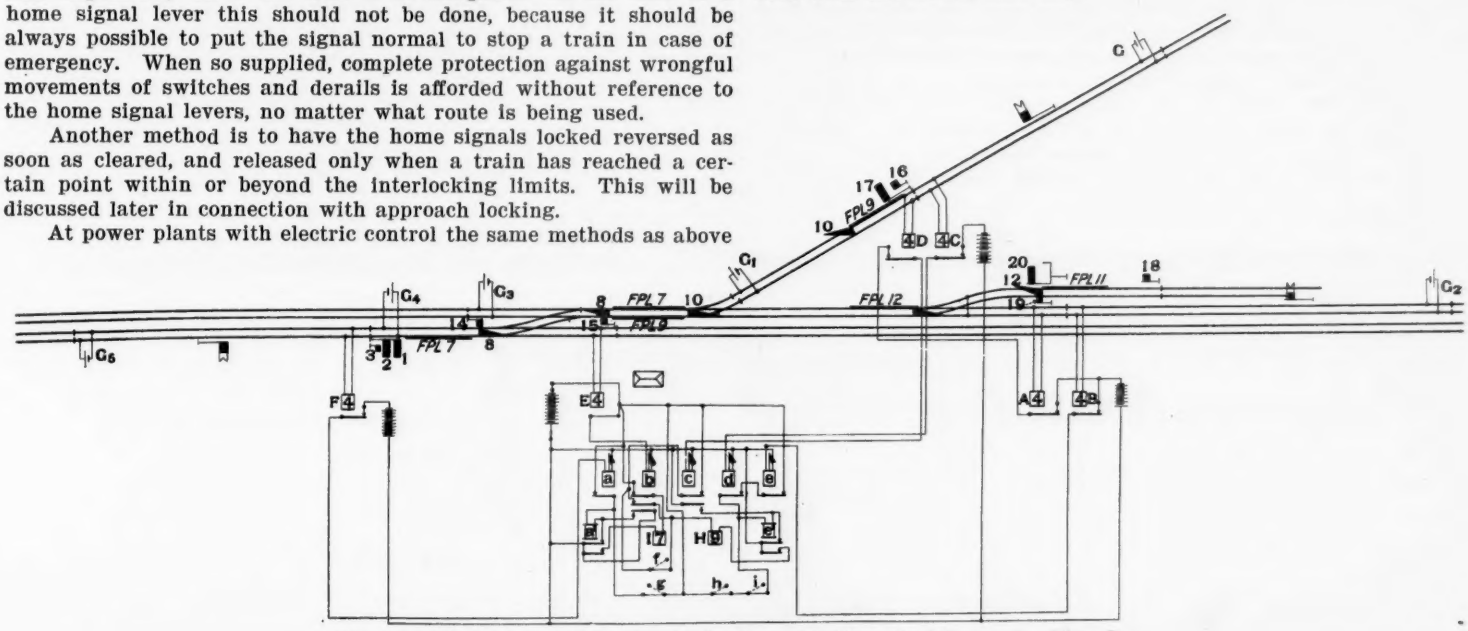


Fig. 4—Electric Locking for Switches and Signals Shown in Fig. 2.

At power plants controlled otherwise than electrically, lever locking is the only variety that can be economically and efficiently applied. Valves and their controlling apparatus are cumbersome and expensive; moreover, in this case, physical connection between the lever and its function is very closely approximated.

Where any one of these systems is applied only to track sections within the home signal limits the use of detector bars can hardly be dispensed with. It takes an appreciable length of time for a track relay to act, and the indicator and the lock consecutively consume equal periods. Therefore, before the lock has acted it may be possible to change at least one of the switches or derails in the route.

Consequently it is advisable to have a detector bar at the entrance to each high-speed route, at least.

To overcome this difficulty and to prevent absolutely any change of route after a train has passed the distant signal at clear, approach locking has been introduced. This is an arrangement of circuits whereby the lock on the home signal, or route lever latch, operates when a train approaches the interlocking plant with the governing signals in a certain position.

Broadly, there are in use two systems: In one the lock acts as above when the train is approaching the distant signal with the home signal clear and holds until the train has reached a point within or beyond the interlocking limits. This may be modified so as to require the distant signals, also to be clear; or it may be made to act when a train has passed the distant signal with the home signal clear. In the other system the route is locked by locks on the route levers or switch levers as in the above, but the home signal is locked reversed with the latch up, as soon as it is cleared, regardless of whether a train is approaching or not. Of course, in dealing with electrically controlled power plants the above may be modified so as to break control and indication circuits as described heretofore.

Fig. 4 shows the approach and other locking circuits for the mechanical interlocking plant shown in Fig. 2. The system is that described for Fig. 2, and the first of the approach locking systems.

A, B, C, D, E, F are 4-ohm track relays controlled by batteries G, etc., through their respective track sections. a, b, c, d, e are indicators. a is controlled by F, b by E, c by A and D, d by C, and e by B. H is a lock on the latch of lever No. 9, and I is a lock on latch of lever No. 7. f, g, h and i are circuit controllers operated by levers Nos. 8, 2, 17 and 20, respectively. Suppose a train approaching on the branch line with the route lined up: Until the first track battery G is passed the route can be changed at will, but as soon as G is passed relay C opens thereby, de-energizing indicator d and the lock H. For, when No. 17 was reversed, circuit controller h was opened and the shunt on the point of d and e removed. Thus No. 9 is locked reversed and the route cannot be changed. No. 9 remains locked until the train has passed beyond signal No. 4, as by its passage relays D and A are successively opened, thereby de-energizing indicator c. This keeps the circuit for lock H open. The signalman is prevented from restoring his lock through putting his signal levers normal while a train is approaching by the special stick wiring of the relays a', e' which control the locks with the "home" indicators. They are controlled by the "distant" indicators a, d, e, and break their own circuits. They can be restored only through the back contacts on their respective "home" indicators when a train is in the home section. Suppose a train approaching without the signals clear; in this case the route would not be locked and the signal man could hold the train at the home signal until ready for it to proceed. At the same time he could allow another train to use any of the routes within the plant.

The necessity for circuit controller f on lever No. 8 is this: Suppose the route through the cross-over set up. Now, to be absolutely safe No. 9 must be controlled by relay E through indicator b; otherwise it would be possible to move any of the switches other than the cross-over while the train is in the eastbound home section. Therefore, f is made to break the shunt around the point of indicator b in the circuit of lock H. It would not do to have lock H controlled by this indicator in every case. If this were done a train in the eastbound home section using the main line route would pre-

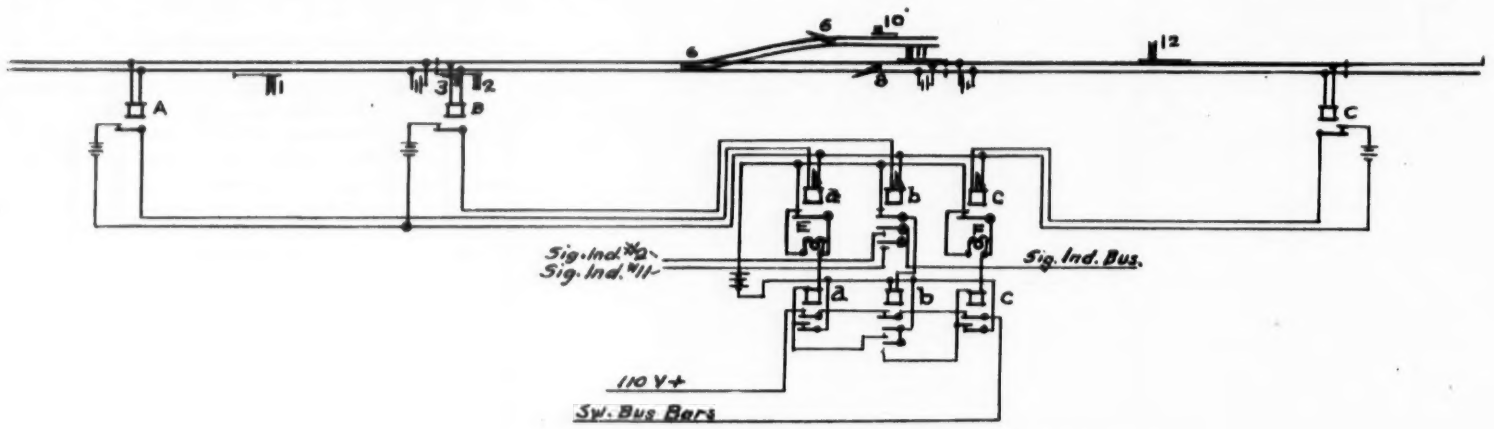


Fig. 5—Approach Locking for Single Switch on a Single Track Main Line.

vent parallel movements in the rest of the plant. These circuits could be used equally well at a power plant.

One modification that is frequently made is to put the circuit controllers on the distant signal levers. When this is done the approach locking takes effect only when the distant signal is clear with a train approaching. In the plant under consideration the distant signals are assumed to be power operated without separate levers. Some advocate breaking the circuit for the "distant" indicators through normally closed circuit controllers on the home and distant signals, so tnat if either should fail to assume the full horizontal position when the levers are put normal, the route would remain locked. The above applies to all that follows.

Fig. 7 shows the circuits for approach and other locking at a simple single track crossing. Here a separate circuit is run for the lock through a circuit-breaker on the distant signals, so that the locking will not release until the distant signal arm is in full horizontal position. The locks act on the latches of the home signal levers to which are attached the shunt circuit controllers F, G, H, I. These circuit controllers are closed only when the levers are normal and the latches down. Fig. 8 shows the same crossing wired with the indicator circuit through a circuit controller on the distant signal arms. Here the distant indicator drops when the distant signal is cleared, whether a train is approaching or not. The locks act as in Fig. 7, but the circuit controllers need not be attached to the latches. They can work with the home signal levers. The stick relays, X, Y, hold the lock circuits open during the passage of a train, whether the signal levers are restored or not. This circuit is suitable for a power plant in which control and indication circuits are broken and there are no locks on the levers. At such a plant stick relays are necessary, as there is no latch locking, unless the section of lever stroke, after indication has been received, is long enough to operate a circuit controller. At a plant where the home signal lever latches are locked stick relays are not needed, as the shunt circuit controller can be made to close only when the lever is normal with the latch down, and this condition will not occur until the lock is released. At power plants the point at which the lever

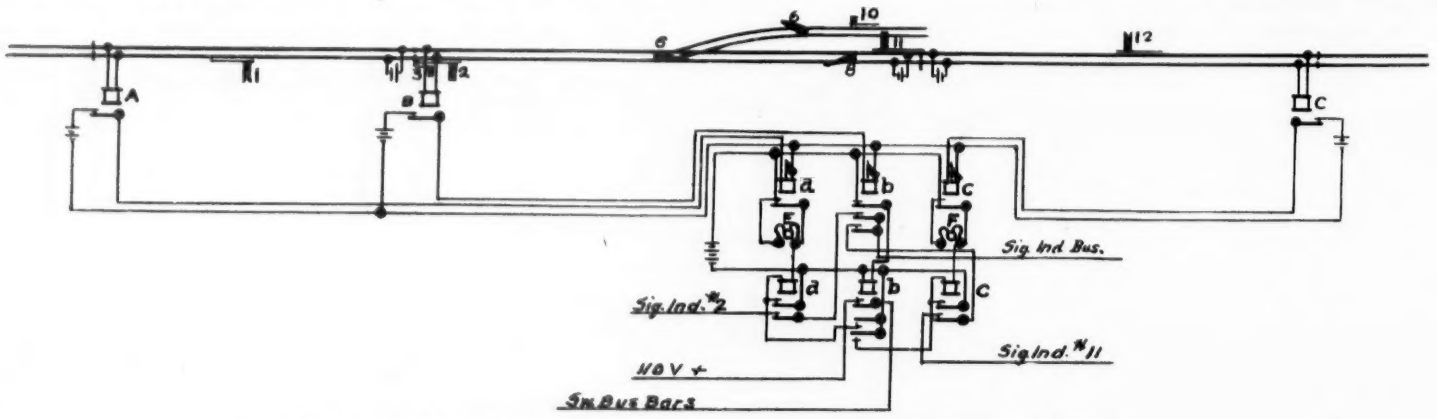


Fig. 6—Approach Locking for Single Switch on a Single-Track Main Line.

is stuck, for the indication can sometimes be used as the latching point as above. But in any case where the shunt circuit controller is operated by a lever other than the one upon which the lock acts, a stick relay must be used.

Next consider a power plant using the first modification described for Fig. 4 but without lever locks. Indicator relays are provided, controlled by track circuits in the usual manner. The indication circuit for each high home signal is broken through a front point of the indicator relay controlled by the track circuit in the

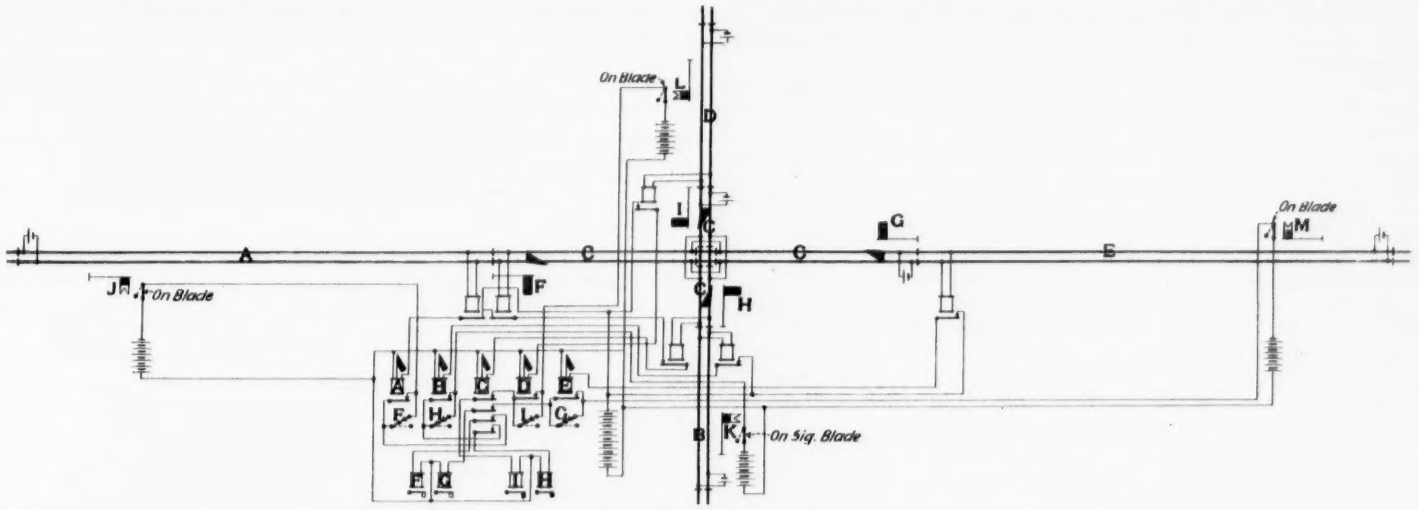


Fig. 7—Approach Locking for Single Track Crossing.

route governed. The approach locking is accomplished by breaking the indicator circuit of the home signal governing a certain route through the front point of a stick relay controlled by a circuit controller on the distant signal lever in parellel with a front point on the distant indicator relay. In this system, unless the distant signal has been cleared, it is possible to put a home signal lever normal at any time, provided a train is not in the section governed. This does away with all delay in case the wrong route has been lined up. It is usual to restore the stick relay in the advance section, when there is one, in order to permit back-up movemenis. With this system there is no delay due to the locking in case the signalman neglects to put his home signal lever normal promptly. As, when the distant signal is clear with a train approaching, the home signal indication is stuck until the train has passed out of the home section, there is no need to break the control circuits of switches in conflicting routes, as the mechanical locking in the machine will prevent switch levers from being moved. With this system signals can be tested at any time without the necessity of using a hand release.

The second system, wherein the home signal is locked as soon as its lever is reversed, is used most extensively at power plants electrically controlled. In this system the indication circuits of the home signals are normally broken through open back points of indicator relays, controlled by the home track circuits, so that the signal lever cannot be put normal without forcing the indication or using a hand release unless a train happens to be occupying the track section. In other words, if the signalman clears a home signal he cannot restore his lever in the usual way unless a train is within the interlocking limits on the track governed. Additional approach locking is accomplished by breaking the power circuits of the switches and derails in the route governed through points on a stick relay. The stick relay is controlled by a circuit controller on the distant signal lever in parallel with the front point of an indicator relay controlled by the distant track circuit. At a mechanical plant there would be a lock on the latch of each high home signal. This lock would be controlled by a normally open circuit with a back point on the home indicator. With this arrangement, as soon as the home signal is cleared, the dog of the lock will drop and lock the latch and will release only when a train enters the home section. The disadvantages of this system are as follows:

1. It is impossible to test signals easily. Every time the lever is reversed it locks itself. This is particularly annoying at mechanical plants in winter, when it is necessary to move the signals frequently to keep them from freezing.

2. It interferes with flexibility of operation. If the wrong route is lined up by mistake it locks itself, thereby causing delay.

3. To make a plant absolutely safe it is necessary to break the circuits of switches and derails in conflicting routes through the same relay. This is to prevent lining up conflicting routes by forcing indications. This is expensive and complicated.

4. It leads signalmen into the habit of forcing the indications, as this is easier than any other method of releasing.

It has one great advantage, however. A signalman is not so likely to go to sleep on duty with the route lined up under this system as under another. The chances are that he would not awake until after a train had passed the releasing point. This would mean delay to following trains and consequent awkward explanations. It has been claimed for this system that the wrong route will be lined up less frequently than with other systems, for the reasons given above. Also, it has been said that an engineman seeing the home signal clear should assume that he had authority to proceed at full speed, even though the distant signal were against him. If this were good practice, why go to the expense of erecting distant signals at the approach to an interlocking plant where the view is unobscured and the line straight for a mile or more? Also distant signals govern the approach to the advance signals as well as to the home signals and the consequences of not being able to stop at an advance signal are the same as those involved in not being able to stop at a home signal. Besides, why not accomplish the approach locking by means of a circuit controller on the home signal lever and obtain the same results with a simpler and more flexible system?

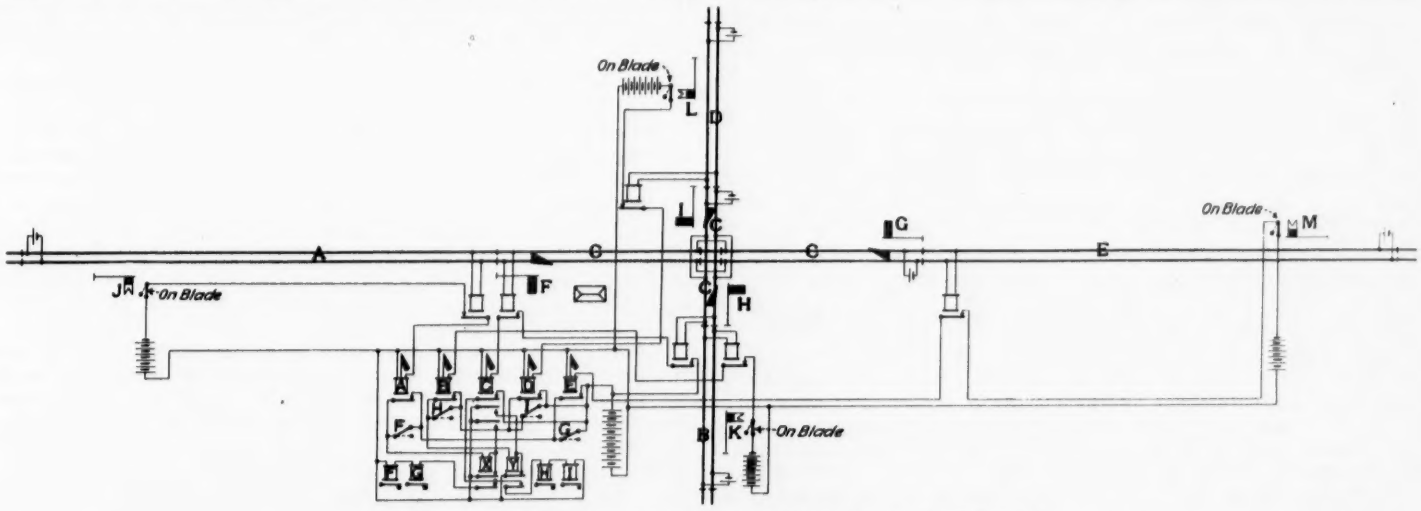


Fig. 8—Approach Locking for Single Track Crossing.

Fig. 5 shows the circuits for the system last described. Here an electric power plant is shown. Fig. 6 shows the circuits for the first system as applied to a similar plant. No lever locks are used in either case. In both Fig. 5 and Fig 6, A, B, C, are track relays;

a, b, c, indicators, a', b', c', are secondary relays, controlled by the indicators. These relays are so made as to carry a heavy current through their points. E and F are circuit controllers, normally closed, operated by the distant signal levers. The operation of the various pieces of apparatus is substantially the same as in the mechanical plant described in Fig. 4.

It will be observed that all circuits for the control of routes are so arranged that if any part of the apparatus should fail or become deranged in any way, the locking would act and hold the route, or possibly the whole plant locked, until the trouble was repaired. This is the governing principle in signaling. If anything fails a dangerous condition must not result.

With any of the systems of approach locking above described detector bars can be dispensed with. It is safe to do away with the bars, for, when it is safe for a train to proceed all high-speed routes are locked before the train has reached the home signal. The time consumed by the electrical apparatus in acting does not count, as the approach track circuits are run far enough back to insure early action. If the electric locking device fails, it locks the route; if a detector bar fails it is inoperative. Electric locking covers the whole route, detector bars only portions of the route.

Nothing has been said about methods of releasing the locking should it get out of order. There are many ways of doing this, but the best and safest is to make a repairman attend to the trouble and relieve the signalman of all responsibility. In this connection the only safe course is to put the relays, the indicators and the machine under locked covers and allow only the repairman to have a key. The repairman should be the only one responsible for the safe operation of the plant; the signalman's only business is to operate the functions for the passage of trains.

One important feature of electric locking yet remains unstated. It compels respect for dwarf signals and makes proper handling of switching movements imperative. In an ordinary plant without electric locking, how often does the last car of a string clear the governing signal before making a back-up or switching movement? How often has a detector bar been caught up or a switch split simply because attention was paid only to the movement of the switch points? With electric locking a train must be out of the section involved before the signalman can move a single switch or even unlock it. Therefore, a train to be switched must, in every case, not only clear the switch, but the back-up signal as well.

Now, all that remains is one question: Does electric locking pay? Accident Bulletin No. 17 of the Interstate Commerce Commission contains the record of a collision (No. 4) and a derailment (No. 3). In the first four persons were injured and the property loss was $4,350. In the second fifteen persons were injured and the property loss was $5,000. Both were caused by defective detector bars and would have been prevented by electric locking. At Marion, N. J., June 2, 1906, a passenger train was derailed at a drawbridge and the engine fell into the water. The bridge was seriously damaged and the property loss was $21,700. The signalman put the signal levers normal and opened the draw after the train had passed the *home signal*. Fortunately, no one was seriously injured. There was no electric locking at the bridge.

Value of Grade Reductions.

BY WILLIAM G. RAYMOND,

Dean, College of Applied Science, State University of Iowa.

Apropos of the recent discussion of economic train speeds, it may be worth while to say that the writer has for some years taught his students that the most economical speed for a freight train is the highest speed that can be safely maintained through a given division with the engine loaded with its maximum load for an assumed minimum speed on the ruling grade, and nothing that he has seen in the discussion mentioned seems to warrant a change in this rule, unless it be to add that the rule holds so long as the locomotive capacity on the ruling grade is not greater than a workable train. This limit will vary on different roads, according to the ruling grade, trackage and traffic.

Nevertheless, it seems to be entirely true, for several reasons, that a heavy train at slow speed costs more per train mile than a lighter train at higher speed, and an effort will be made to show that in determining the value of reductions in ruling grade, allowance should be made for this fact. Considering that the whole estimate of the value of grade reduction is based on a segregation of operating expense that is at best but roughly approximate, the point may seem hardly worth making, but in a problem that recently came to the writer, the inclusion of an allowance for the extra cost per train-mile for heavier trains resulting from the grade reduction lessened the theoretic value of that reduction by about one-fifth, which seems to be too large a fraction to ignore, particularly as the error is systematic and not as likely to be one way as the other.

An approximate statement of the problem will be given and three methods of determining the result compared.

On a division 180 miles long the ruling grade is 1.0 per cent. and the value of the contemplated reduction to 0.8 per cent. is desired. As an average of the year there are 18 daily trains both ways, six passenger trains unaffected by the ruling grade as such, six slow freight trains making 12 miles an hour on the ruling grade, and five fast trains making 15 miles an hour on the ruling grade, with one light way freight unaffected by the ruling grade as such. The maximum trains are drawn by a 10-wheel locomotive having 131,200 lbs. on the drivers, 2,586.8 sq. ft. of heating surface, and a total engine and tender weight of 304,000 lbs. The average train-mile cost is $1.24 and money is worth 5 per cent.

The boiler tractive effort of the locomotive is determined by the formula:

$$T\,b = \frac{146 \times \text{heating surface}}{\text{speed in miles per hour}}.$$

With train resistances for 12 and 15 miles an hour respectively for the formula

$$R = 3.5 + 0.0055\ S^2 + \frac{16}{(S+1)^2},$$

And grade resistances of 20 and 16 lbs. per ton respectively on the 1.0 per cent. and 0.8 per cent. grades, the net loads behind the tender, excluding a 15-ton caboose, will be:

	12 miles.	15 miles.
1.0 per cent. grade	1,120 tons.	848 tons.
0.8 per cent. grade	1,373 tons.	1,044 tons.

Following the usual assumption that the trains affected by the ruling grade will be in number inversely as the net hauling power of the locomotive, the six slow trains required by the 1.0 per cent. grade will become 4.86 trains on the 0.8 per cent. grade, and the five fast trains will become 4.05 trains on the 0.8 per cent. grade. The total saving then will be 2.09 daily trains, the fraction being allowable because it represents a yearly average. Without doubt the fast trains cost less per train-mile than the slow trains, but in the problem an average freight train-mile cost will be used. If the average train-mile cost on the road is $1.24, freight train-miles may cost perhaps $1.42 and passenger train-miles $.88. A somewhat careful guess is that the addition to the cost per train-mile for heavier trains is about 1 per cent. for each 10 per cent. increase in the weight of train, and a careful estimate of the items of daily expense affected by a change in the number of trains indicates that about 45 per cent. of the average train-mile cost is saved or added for each train-mile saved or added, the tonnage remaining constant.

These results, then, by the method of Mr. Wellington:

Annual saving = 365 × 2.09 trains over 2 × 180 miles at 45% of $1.24 = $153,241.31.

If, instead of using the average train-mile cost for this problem the average train-mile cost of the trains affected, namely, the freight trains, be used,

Annual saving = 365 × 2.09 × 2 × 180 × .45 × 1.42 = $175,486.01.

But the hauling capacities of the locomotive on the two grades indicate that the trains on the lighter grade will be roughly about 20 per cent. heavier than those on the 1.0 per cent. grade, and hence their train-mile cost will be increased perhaps 2 per cent. The number of trains so affected is 8.91, and the annual cost of these trains at 2 per cent. of $1.42 is about $33,250, which sum should be deducted from the annual saving by the second method, giving $142,236.

For this particular problem the first method, which is that of Mr. Wellington, gives a result closer to the truth than does the second, which has been used in the more noted discussions of grade reduction. But it is considerably in error on the wrong side, and the second method, which has been so much used, is in error by between one-fifth and one-fourth, assuming the third method correct.

Whatever may be the opinion as to the reasonableness of the figures used, the conclusion seems to be entirely reasonable that the greater train-mile cost of the heavier train should be considered in determining the value of grade reduction, for this item in this particular problem reduces the theoretical reduction values by nearly $3,700 per mile of road.

While it is of much less importance, the same allowance should be made in determining the average train-mile cost to be used on the lower grade line in discussing the values of the reduction of distance, rise and fall and curvature. That is, by the method of Mr. Wellington the new train-mile cost would be

$$\frac{18 \times \$1.24 - 2.09 \times .45 \times 1.24}{18 - 2.09} = \$1.3292+$$

By the second method

$$\frac{18 \times \$1.24 - 2.09 \times .45 \times 1.42}{18 - 2.09} = \$1.319 -$$

When the effect of the greater cost of the heavier trains is introduced the result is

$$\frac{18 - 1.24 - 2.09 \times .45 \times 1.42 + 8.91 \times .02 \times 1.42}{18 - 2.09} = \$1.335-$$

No serious blunder is likely to result from the use of any one of these train-mile costs for the minor items, and although the last one gives the greatest train-mile cost and will therefore show the greatest values for given rise and fall, distance and curvature reductions, it would seem to be the wiser figure to use, since it is probably nearer the truth than either of the other two.

American Railway Association.

The spring meeting of the American Railway Association was held at Chicago, April 24, over 250 delegates being present. The present membership of the Association is 329 companies, operating 234,321 miles. The Executive Committee reported that the President had appointed a Special Committee on Standard Location for Third Rail Working Conductors and also a Committee on Car Efficiency. The report of this last named committee was printed in the *Railroad Gazette* last week, page 581. As a result of the report and the discussion on it, which was preceded by protracted informal meetings and discussions on the Monday before the meeting, the Association adopted the three recommendations of the committee, the last one of which is an endorsement of the American Railway Clearing House and what it is doing looking toward the establishment of a general freight car pool or its equivalent. It was recognized, however, that the movement for anything in the nature of equal interchange of cars must proceed very slowly and the views of the minority of the car service committee (see below) were recognized to the extent of ordering a letter ballot on the universal adoption of a penalty of $5 a car for diversions. The proposed diversion rule, which, if adopted, will go into effect September 1, is given below. In short, the Association is in favor of a strong effort to pool cars, but in the meantime, believes a penalty necessary and useful—in spite of the committee's conclusion that the roads which have been trying the penalty have not found it very satisfactory.

The statistics of car movement gathered by the Committee on Car Efficiency and by the Clearing House, have thus far been kept confidential and reported only in totals or with names of roads omitted but henceforth roads will be asked to permit their figures to be sent to other companies to be sent to all members.

The Committee on Car Service reported that it had decided adversely on the question, referred to it last autumn, whether a lower per diem rate should be adopted for switching and terminal railroads. The committee holds that the reclaim provided for in the present rule 5 is generally sufficient, and that in many places it is found to be so large that the switching roads receive more than they pay out. The committee seems to have found that the roads which have experimented with the diversion rule have found no marked benefit from it; and the free use of foreign cars without regard to the rights or wishes of the owners is, if anything, more general than ever. Therefore, the committee was not in favor of a diversion rule; moreover, a considerable number of roads are trying to effect reform in exactly the opposite direction, that is to say, by promoting the efforts of a clearing house. The committee reports that the General Superintendents' Association of Chicago is discussing a set of rules to regulate the transfer of cars, which it is hoped will be suitable for general adoption.

Acting on the suggestion of the Association of Transportation and Car Accounting officers the committee recommended the adoption of the following rules for tracing interline carload freight, and they were adopted by the Association:

1. Each tracer for carload freight should be handled through the Car Service Department.

2. No tracer shall be started until the shipment shall have had sufficient time to reach its destination. (Do not confuse with requests to expedite freight. See footnote.)

3. No tracer shall be handled by wire except in case of perishable or highly important freight, or a shipment which has been unreasonably delayed. Such tracer when received by wire should be answered promptly by wire.

4. Each tracer should show the initials and number of car, commodity, point of origin, date of forwarding, route, consignee and destination.

5. (a) When an interline tracer has been properly started as per Rules 1 and 2, it shall be promptly forwarded to the road to which the shipment was delivered, and the originator of the tracer shall be immediately notified of the date, time and place of such delivery; the road making delivery to consignee will promptly advise the originator of the tracer direct, of the date of arrival at destination.

(b) If the shipment has been transferred en route, that information shall also be transmitted, referring to the original car number.

6. When a tracer originates with the consignee, it shall be transmitted from one road to another in reverse order to the route until the shipment is located, when the tracer shall be handled as provided by Rule 5.

NOTE.—These rules do not refer to requests to expedite the movement of freight.

The committee submits two standard forms for interchange and junction reports, one small and brief, the other larger and giving point of shipment, final destination and contents of cars.

The committee proposes to draw up a revised set of rules for car service (demurrage) associations.

Two members of this committee, Messrs. Trump (Penn.) and McKenna (C., M. & St. P.), presented a minority report in which they declared that as anything like a pool or clearing house, in order to be successful, must be agreed to by all roads, it would be better to continue the attempt to cure diversion by a penalty; to adopt a more stringent rule in place of Pier Diem rule 3, for the return of foreign cars, and with a penalty of $10.

The Committee on Safety Appliances reports the number of freight cars in service on the lines of 290 companies reporting on January 1, 1907, as 1,902,582, of which 94.3 per cent. are equipped with air brakes. New freight cars contracted for aggregate 201,239.

The Committee on Transportation of Explosives stated that the Bureau for the Safe Transportation of Explosives and Other Dangerous Articles had been duly organized in New York City on November 21, 1906. The committee also stated that Major B. W. Dunn had been appointed Chief Inspector of the Bureau. Dr. C. B. Dudley, Chemist of the Pennsylvania Railroad at Altoona, Pa., is president of the Bureau; N. D. Maher, General Manager of the Norfolk & Western, Vice-President, and W. F. Allen, New York City, Secretary and Treasurer. Eighty-six companies have joined the bureau.

The Committee on Standard Rail and Wheel Sections reports that the standard wheel section tentatively adopted by the Master Car Builders' Association last June, is proving satisfactory. The committee believes that there is no necessity for a radical change in the A. S. C. E. rail section, so far as it relates to the wheel as a bearing surface. The section has not been criticized, except with a view to strengthening the rail by a better disposition of the metal.

"The committee feels that some consideration should be given to the question of canting the rails; to conform to the coning of the tread, and experiments are now being conducted to determine the effect of this arrangement, especially in the feature of wear.

"The introduction of electric motors of low center of gravity, long, rigid wheel base, and wheels of small diameter, will no doubt have an effect on rail wear in the future. The effect on the rail in the London tubes has already caused comment and has led to a suggestion for the appointment of a Committee of the English engineers to investigate the subject."

The committee has consulted expert chemists and metallurgists and is considering a code of specifications for the manufacture of steel rails. This, when formulated, will be discussed with the rail makers.

The Committee on Standard Location for Third-Rail Working Conductors has appointed a sub-committee to compile a code of terms, and will co-operate with committees of the American Railway Engineering and Maintenance of Way Association and the Master Car Builders' Association, the co-operation of these associations being deemed necessary to the proper treatment of the subjects connected with third rails. The committee recommended that it be empowered to prescribe clearances for overhead equipment, and the Association so ordered.

The Committee on Statistical Inquiry reports the results of its correspondence with Statistician Adams, of the Interstate Commerce Commission, in regard to what the government proposes to require in the way of operating statistics, when the new provision of the law is put into effect. Professor Adams intimates that statistics of physical elements, such as equipment, maintenance and operation, with standard units for the measurements of transportation performance not only will be prescribed by the commission, but are needed to enable the commission to judge of the results of railroad operation, but he assures the committee that nothing will be done to interfere with the liberty of experiment necessary for the development of railroad practice. Professor Adams invites the co-operation of the association in the development of a correct theory of statistics. The committee submits a modified classification of operating statistics. This classification is the result of conferences with Professor Adams and, apparently, is identical with the one which he intends to adopt. It does not differ materially from that heretofore recommended by the committee.

The Committee on Standard Cipher Code reports that 3,050 copies of the code have been printed and sold and a fourth thousand is now being made. A list of the users of the code has been issued, revised to date.

The diversion rule on which members are to be asked to vote between now and May 25, to be put into effect September 1, is as follows:

First Proposed Form of Rule 3 of the Per Diem Rules.

Rule 3. Foreign cars must be handled as follows:

WHEN LOADED.

a. Loaded (via any route) so that the home road will participate in the freight rate.

b. Loaded to the road from which originally received, if such loading is in the direction of the home road, *but not otherwise.*

c. Loaded to an intermediate road in the direction of the home road.

(NOTE.—A road or a combination of roads competing with the road owning the car from point of delivery to destination shall not be considered as an intermediate road or roads.)

d. Loaded in local service in the direction of any junction point with the home road.

e. Cars may be loaded locally in an opposite direction from the home road or home route if to be loaded according to section *a*, *b*, or *c*.

WHEN EMPTY.

Foreign cars must be handled as follows:

f. Empty cars belonging to a system having a direct connection must, unless the owner objects, be returned to such connection regardless of whence they came.

g. The car owner shall have the right to demand the return of his empty cars at the junction point where delivered loaded.

h. Empty cars may be sent in an opposite direction from the home road or home route, if to be loaded according to section *a*, *b*, or *c*.

i. Empty cars may be delivered to connecting road, switching or otherwise, to

be loaded in accordance with section *a*, *b*, or *c*, *but not otherwise.*

j. When necessary to return cars empty belonging to roads other than direct connections, they may be delivered to the road from which received.

WHEN IN SWITCHING SERVICE.

k. Cars received loaded in switching service must be confined to switching territory, and when made empty must be returned to the owner if a direct connection within that territory, or otherwise to the road from which received.

l. For each violation of these rules, actual or constructive, a penalty of five dollars ($5.00) shall apply.

m. The Chairman of the Committee on Car Efficiency of the American Railway Association is hereby authorized to act as sole arbitrator to determine, upon evidence submitted, whether or not there has been a violation of this rule.

Second Proposed Form of Rule 3 of the Per Diem Rules.

Rule 3.—Sections *a* to *l* the same as in the first form.

m. The Chairman of the Committee on Car Efficiency of the American Railway Association is hereby authorized to act as sole arbitrator, to determine, upon evidence submitted whether or not there has been a violation of this rule; *and will, on request, suspend or modify the operation of this rule in favor of any road that has on its lines less than 95 per cent. of the number of cars it owns.*

The committee on car efficiency laid before the meeting a letter from a Chicago lawyer, Mr. W. J. Calhoun, giving an opinion as to the right of railroads under the Interstate Commerce law to refuse to deliver cars to roads which refuse to enter the Per Diem agreement. The law now requires railroads to establish through routes and through rates; and, even before the law so stipulated, these practices were so common that they should be treated as necessities of commerce. The interchange of cars is also so common that the practice must be considered a necessity in such commerce. In so important and expensive a matter, elaborate and precise rules and regulations are held by the courts to be a reasonable necessity. Numerous decisions of the Supreme Court of the United States are cited to sustain this. In considering the fairness or justice of any rule or regulation the courts will base their opinions on reasonableness, and will justify rules designed to prevent confusion and discrimination by the establishment of uniformity of practice. A railroad that refuses to submit to reasonable rules and regulations or to pay reasonable compensation for the use and detention of cars may, therefore, be refused the use of such cars.

Summarizing his conclusions Mr. Calhoun says:

"1. Can a railroad company legally refuse to furnish a shipper with its own cars to be loaded to another railroad, provided such railroad refuses to abide by the Per Diem Rules?" With the understanding that the Per Diem Rules are reasonable, and the charges fixed are reasonable and just, my answer is in the affirmative. A railroad, under such circumstances, is justified in refusing to furnish a shipper with cars.

"2. Can a railroad company legally refuse to furnish a shipper with cars of a second railroad, for loading to a third railroad company, provided the third railroad company refuses to abide by the Per Diem Rules? Under the Per Diem Rules the first railroad is responsible for per diem and the cars." If the cars of the second railroad are to be delivered to the shipper with the consent or at the request of the owner, then the first railroad cannot refuse to deliver to the shipper. In such case the first railroad is not responsible for the cars or for the per diem when they are finally delivered to the third railroad. If, however, the cars of the second railroad come into the care of the first railroad, in the ordinary course of business, without any such consent or direction as above noted, then the first railroad is responsible to the owner for the per diem, as well as for the safety and return of the cars. In such a case, the first railroad can refuse to deliver the cars of a second railroad to a shipper, for loading and delivery to a third railroad, when the latter refuses to pay the per diem.

"3. Can a railroad company refuse to make through freight rates to points, on another railroad, provided such railroad company refuses to abide by the Per Diem Rules?" This question is substantially of the same import as the first, and the answer to both is the same. Through rates means through routing, and both expressions involve the use of cars; and where reasonable rules and regulations are not recognized, a carrier is not compelled to establish a through rate.

Mr. Hale also read at the meeting the following letter from Hon. Franklin K. Lane, of the Interstate Commerce Commission:

"It is our desire to see everything done that is practicable to stimulate the movement of equipment. . . . We have found throughout the country that railroads have been bidding against each other for business by the granting of free time. Instances of this kind arose at our hearing in Chicago upon the general subject of car shortage, where the shippers confessed that they did not need the time that was granted them, and were willing to have it reduced from five to two days. Every effort put forth by the railroads to stop the using of cars as warehouses and limit their use to purely railroad purposes will have our cordial co-operation. Shippers must have a reasonable and not an excessive time to unload, and I think that most of the shippers realize that it is a part of good citizenship at a time such as this to release equipment speedily in the interest of the general business of the country."

W. C. Brown (New York Central) was re-elected President, and W. A. Gardner (Chicago & North-Western), Second Vice-President. The Association will hold its next meeting in Norfolk, Va., October 23, 1907.

The reason for adopting a diversion rule was voiced by Mr. C. A. Goodnow, General Manager of the Chicago & Alton, after the meeting, as follows:

"It has become apparent to operating officials that the charge of 50 cents a day for the use of interchanged cars does not bring the cars home, and many of the large Chicago roads, in spite of the fact that they have bought or built a very large number of cars, have to-day a smaller number of their own cars on their lines than ever before; and in some instances the difference between their own equipment on foreign lines and foreign cars on their own lines amounts to four or five thousand cars. This has made it clearly apparent that a diversion rule is absolutely necessary. A penalty for diversion does not cover everything, however; and we shall find that a penalty for delay must be added. The use of foreign cars in local service will still be easy [by roads disposed to be unfair], and the 50-cent rate ought to be increased, after 30 days to say, $2."

If a carrier accepts freight from a shipper consigned to a point on another line which refuses to pay a reasonable per diem, and the first line gives through billing therefor, or is a party thereto, such carrier will be responsible to the shipper for any default in the transportation. If the shipment is to Chicago, for instance, the carrier may bring it to that city, but may refuse to deliver it to a connection that refuses to pay the per diem, provided there is nothing in the bill of lading that requires such delivery.

A carrier may refuse to allow its empty cars to go to a connecting line for the use of a shipper located thereon if such road refuses to pay per diem. If a carrier accepts loaded cars from a connection, billed to another connection, and the latter refused to pay per diem, I think the intermediate carrier will be bound to make the delivery. It should give notice to all connections that it will not accept cars billed to such other carrier, for the reason it will not pay per diem charges, and then it may refuse cars subsequently tendered.

Mr. Kruttschnitt, Director of Maintenance and Operation of the Union Pacific and Southern Pacific, speaking after the meeting, said:

"The increased per diem will unquestionably act as a powerful incentive for the return of cars to owners. Small roads not equipped will certainly take steps to provide themselves with cars in lieu of paying twice the rental that they formerly paid. Already the raising of the per diem from 25 to 50 cents by a considerable number of roads, coupled with the strong expectation that the 50 cent rate would be adopted as the standard rate, has impelled many large roads that were short of equipment to order large numbers of cars.

"The proposed diversion rule to be submitted to letter-ballot, will make it much easier to get cars home. The penalty for diversion is sufficiently severe to make the practice decidedly unpopular, and the clause that makes the Chairman of the Committee on Car Efficiency of the American Railway Association sole arbitrator to determine whether there has been a violation of either the letter or spirit of the rules will prevent car-service agents from exercising their ingenuity to divert cars in some new way without violating the letter of the rules.

"I think the action of the Association a distinct step in advance in the line of reform of car service abuses. Its endorsement of the Chicago Clearing House and incorporating its statistical features as part of the Association work will strengthen the Clearing House and no doubt will secure a large number of adherents. The various forward steps affecting car service and distribution of cars all harmonize with the plan of a car pool, and some form of car pool will no doubt ultimately be adopted for all freight cars."

Another Chicago officer said:

"The situation with us is desperate. If we had only our full equipment or its equivalent, we should be well satisfied. The clearing house idea, and the car pool are all right, and we are not opposed to such a scheme, but it will take a long time to get it on a satisfactory working basis. Some plan must be adopted that will remedy the situation quickly, and the $5 diversion penalty seems the most practicable. It ought to be two, three, or even four times this, but $5 will do for a starter. As a sample of our troubles look at this record of the movements on foreign lines of one of our special service cars, which has been absent continuously for a year and three months. This is an exceptional case, though for an ordinary box car it would not be unusual."

MOVEMENTS OF A FREIGHT CAR IN STRANGE LANDS.

To—	1906.	To—	1906.
Missouri Pacific	Jan. 28	El Paso & S. W.	July 3
Denver & Rio Grande	Jan. 30	Cananea, Y. R. & Pacific	" 23
Missouri Pacific	Feb. 2	El Paso & S. W.	" 31
Union Pacific	" 13	Chic., R. I. & E. P.	Aug. 9
Missouri Pacific	" 26	Chic., R. I. & Gulf	" 14
Union Pacific	Mar. 3	Chic., R. I. & Pacific	" 15
Colorado Southern	" 6	Cin., Cleve., Chic. & St. Louis.	" 19
Union Pacific	" 21	Chesapeake & Ohio	" 26
Colorado Southern	" 27	Cin., Cleve., Chic. & St. Louis.	Sept. 2
Chic., Burl. & Quincy	" 29	Peoria & E.	" 15
Colorado Southern	Apr. 8	Chic., R. I. & Pacific	" 18
Atch., Topeka & Santa Fe	" 9	Colorado Midland	" 23
Colorado Southern	" 9	Denver & Rio Grande	" 24
Fort Worth & D. C.	" 10	Rio Grande Western	" 29
Chic., R. I. & Gulf	" 11	S. Pedro, L. A. & S. L.	Oct. 1
Chic., R. I. & El Paso	" 12	Rio Grande Western	" 28
El Paso & N. E.	" 13	Denver & Rio Grande	Nov. 5
Galveston, H. & S. A.	" 16	Chic., Burl. & Quincy	" 25
Texas & N. O.	" 20	Union Pacific	Dec. 17
El Paso & S. W.	" 23	Chic. & North-Western	" 21
Nacozari	May 12		1907.
El Paso & S. W.	" 26	Chic., St. Paul, Minn. & O.	Jan. 16
Southern Pacific	" 31	Chic., R. I. & Pacific	Feb. 6
Gila Valley, G. & N.	Jun. 3	Ter. R. R. Association	Mar. 5
Southern Pacific	" 14	Chic., R. I. & Pacific	" 7
El Paso & S. W.	" 18	Ter. R. R. Association	" 22
Nacozari	" 20	Chic., R. I. & Pacific	Apr. 22

(Gone one year and three months.)

Freight Handling at the Port of New York.*

The port of New York occupies a unique position. Situated in latitude 40 deg. 42 min. north and longitude 74 deg. west from Greenwich, it occupies the most central location on the Western Hemisphere, and with the development of its transportation facilities it will soon not only be the commercial emporium of the Western Hemisphere, but of the world.

The few small wharves and docks which existed in the first quarter of the nineteenth century have, in less than 100 years, grown until, at the present day, over 112 miles of wharf room are in use on the New York side alone. The annual income to the city from these properties aggregates over three millions of dollars. Thirty important trans-Atlantic lines operate between New York and European ports, their combined fleets aggregating over 100 first class vessels. Over 120 million bushels of flour and grain are received annually. Of this amount about 110 million is received by rail and the balance by canal and coastwise vessels. Twenty thousand tons of salted beef, 135,000 tons of bacon and hams, 145,000 tons of lard, and 15,000 tons of pork are exported annually. Over 4,000,000 head of live stock are received every year at the port of New York. Over 500,000,000 gallons of petroleum are exported here each year and distributed to the most remote corners of the earth. When to the above items are added the vast quantities of coal, dairy products and every conceivable article of manufactured goods that annually pass through New York, some conception may be gained of the facilities required.

The New York Central is the only railroad having direct rail connection with Manhattan Island, and consequently the only railroad which can make local deliveries direct from its cars to consignees. All other railroads make local deliveries in the Borough of Manhattan and at the steamship piers by an extensive system of lighterage. At the terminals of the great trunk line railroads on the Jersey shore, every facility has been provided for the expeditious handling of freight that human ingenuity can devise and unlimited financial resources provide.

The railroads having extensive terminal facilities at New York are the New York Central, Pennsylvania, New York, New Haven & Hartford, Erie, Lehigh, Lackawanna, Baltimore & Ohio, Central Railroad of New Jersey, New York, Ontario & Western, and Long Island. Each of these railroads maintains on Manhattan Island at least one team delivery yard, to which cars are brought on floats and unloaded directly by teams.

Upon the arrival of freight at the port of New York for export, the foreign freight agent in whose care it is billed, notifies the proper steamship agent, when a permit for its delivery to a specific ship is furnished. Heavy freight for other harbor delivery, such as structural steel and iron, lumber, marble and heavy machinery, is treated in exactly the same way, the consignee furnishing instructions for such domestic delivery on the back of the arrival notice received from the railroad agent. Grain in bulk is either delivered direct from cars or unloaded from cars into an elevator where it is graded in accordance with the rules of the New York Produce Exchange, and put in with other similar grain so that its identity is lost unless the shipper orders its identity preserved. When delivery of grain in an elevator is to be made, the desired quantity of a particular grade and kind to which the consignee is entitled is allowed to run through a chute into the steam lighter and in a similar manner turned into the hold of the ocean carrier.

One of the most modern tipples made by the Brown Hoisting Machine Co. is that in use at Port Morris by the New York Central.

The term lighterage originally meant the carrying of freight from vessel to shore in small boats, where there were no dock facilities or where the water was too shallow to permit of a close approach to the shore. Until recent years piers and dock facilities were unknown in many of the large ports of the world and all kinds of freight was handled in the most primitive manner. This is still noticeably so at Hong Kong, where cargoes are floated in Chinese junks. At Yokohama all freight is lightered. At Bombay and Calcutta "Dhows" are extensively used. At Marseilles all oil is lightered in small boats. At both the Atlantic and Pacific ports of South America all cargoes are lightered, the vessels laying in the open roadsteads, while cattle, horses and swine are dropped overboard and corralled after swimming ashore. At London lighterage is employed in much the same manner as it is at the port of New York. But at this port the lighterage business has been so developed and extended that special classes of vessels have been designed to meet various requirements, and it has extended far beyond the harbor limits. On the east it has been extended to every Sound harbor and the coal barge goes to Boston from the docks at Edgewater, Weehawken, Hoboken, Communipaw and Amboy, and a well-equipped line of tugs and barges supplies the mills on the Kill von Kull with plaster from the Nova Scotia mines. To the north (Hudson river), the immense brick, ice and bluestone traffic is lightered to this port. To the south it may be said to extend to the soft coal wharves at Norfolk and Newport News.

*From an article by William S. Root, in *Railroad Men.*

The most general type of lighter employed here is the steam scow, with mast and boom for hoisting freight. Both the hand winch and steam engine are used. Cargo is carried both on the deck and in the hold, the scows varying in capacity from 300 to 800 tons. Freight is taken direct from or delivered to the car, the pier or steamship, and consists especially of heavy freight such as iron, stone, logs, bale cotton, hogsheads of tobacco and molasses. When finer freight is carried it is protected by waterproof canvas covers. Some of these boats are equipped with the steel "A" frame, with steel boom and wire rigging in place of the mast. They lift from 25 to 240 tons. On one of these the largest coast defense gun in the country weighing 116 tons was taken direct from the Watervliet Arsenal to Sandy Hook in 1903.

The covered barge, capacity from 300 to 500 tons, also scow shaped, is used for all classes of package freight, but especially for that which needs protection from heat, cold and wet weather such as packing-house products, cereals, green fruits and vegetables.

The open steam lighter, capacity 200 to 400 tons, with mast and derrick rigged to lift from five to 50 tons, is the express boat of the lighterage fleet. They are assigned for all small orders both east and westbound, export and domestic. They are especially useful in delivering and receiving at piers and warehouses where the slips are congested by other craft.

The covered steam lighter is of the same dimensions as the open, has mast and boom and bears the same relationship to the latter that the covered barge does to the open barge.

The grain barge, capacity 28,000 bushels, is used to float grain from the railroad and private elevator and the car to the steamship's side, whence it is transferred to the ship's hold. They are also used to deliver grain to the milling and brewery plants of Greater New York. The cargo is carried in bulk in the hold. She has a continuous hatch with high combings and is similar to the 7,000-bushel boat of the Erie and Champlain canals. In connection with the grain barge, the floating elevator is an important factor in harbor work. Indeed, it is an absolute necessity in handling export grain.

Barges built on the same lines as the grain boat are used to take coal from the docks and cars to the steamships, power-houses, yards, gas houses and various industrial plants on the water front. The capacity of these barges is from 200 to 1,000 tons each.

The car-float is the factor which makes lighterage play such an important part in the development of domestic commerce at the port of New York. The first car-float was constructed for the Pennsylvania Railroad in 1868. It carried six 12-ton capacity cars. It was 165 ft. long and 34 ft. wide. The float now in general use for pier and bulkhead delivery carries twelve 34-ft. cars, and has two tracks with a platform in the center, making it possible to load or unload all of the cars at the same time, greatly facilitating the work of the crowded freight stations on the North and East rivers. One of the latest design of floats that have been constructed is entirely of steel 318 ft. long, 40 ft. wide, has three tracks and will carry twenty-three 50-ton capacity cars. It is doubtful, however, whether this float, owing to its great weight and the difficulty of handling it in crowded areas will prove an unqualified success.

The largest and most powerful tugs used in towing these floats develop as high as 1,200 h.p. They occupy much the same relation to the handling of the lighterage traffic that the switch engine plays in a large freight yard. In fact, the operation of the lighterage system at the port of New York is analogous to the operation of a union transfer terminal.

New York, with her high rentals for steamship piers, averaging as high as $100,000 per annum, and the extra charge for lighterage, with the inevitable delays, cannot compete in the export trade with Boston, Norfolk, Baltimore, Philadelphia, with their low dock rentals and direct rail connections on the pier. Many movements have been set on foot and thousands of dollars have been expended in planning a great export terminal on the Jersey shore, but as yet nothing has been accomplished, and the wisdom of such a project has even been doubted by leading experts on the transportation facilities of New York.

Some idea may be gained of the magnitude of the lighterage business, when it is considered that, beside the great railroads terminating at this port, each of which maintains its own floating equipment, over 30 independent companies also are engaged in this traffic. The floating equipment of the Erie Railroad comprises 70 covered freight barges, 27 hand-hoist lighters, three steam-hoist lighters, 25 car-floats, three steam lighters, two live-stock boats, 410 harbor canal-boats, nine sound coal boats, 12 coastwise coal barges, 14 tugs, or an aggregate of 575 vessels.

The New York Central had in 1906: Tugs, wood, 2, steel, 19; freight propellers, wood, 3, steel, 3; steam hoisting barges, 10, total capacity, 4,100 tons; hand hoisting barges, 18, total capacity, 3,100 tons; covered barges, 88, total capacity, 22,100 tons; open deck scows, 4, total capacity, 2,200 tons; grain boats, 39, total capacity, 17,130 tons; car floats, 41, total capacity, 486 cars; ferryboats, side wheel, single deck, 5, screw, double deck, 3; total floating equipment, 235; total value of fleet, $2,215,847.

Track Deformations and Their Prevention.*†

BY G. CUENOT,
Government Engineer of Bridges and Highways, and connected with the Board of Control of the Paris, Lyons & Mediterranean Railway.

VIII.

SHOCK AT THE JOINT (CONTINUED).

The cause of the defective state of the track at the passage of the joint being well shown by the analysis of it by Mr. Freund, it was of interest to verify the manner in which a joint of a track provided with composite ties behaves, in comparison with what habitually takes place. If the theory of Mr. Freund is exact, the fall ought to be very much diminished at the passage of the joint with composite ties.

Care was taken to observe the deformation of the track before any test, and as it was found that this deformation was increased, the profile was corrected by means of hoop iron wedges placed between the splicing and the head of the rail. Fig. 20 displays the condition of the joints before and after placing the wedges; the latter have reduced, at least by one-half, the slope at the extremities of the rails, a slope which could reach about .08 in. in 19.69 in. The permanent deformation of the rails was still more apparent on track provided with composite ties than on that provided with

†Authorized translation by W. C. Cushing, M.A., B.S., Chief Engineer of Maintenance of Way, Pennsylvania Lines West, Southwest System.

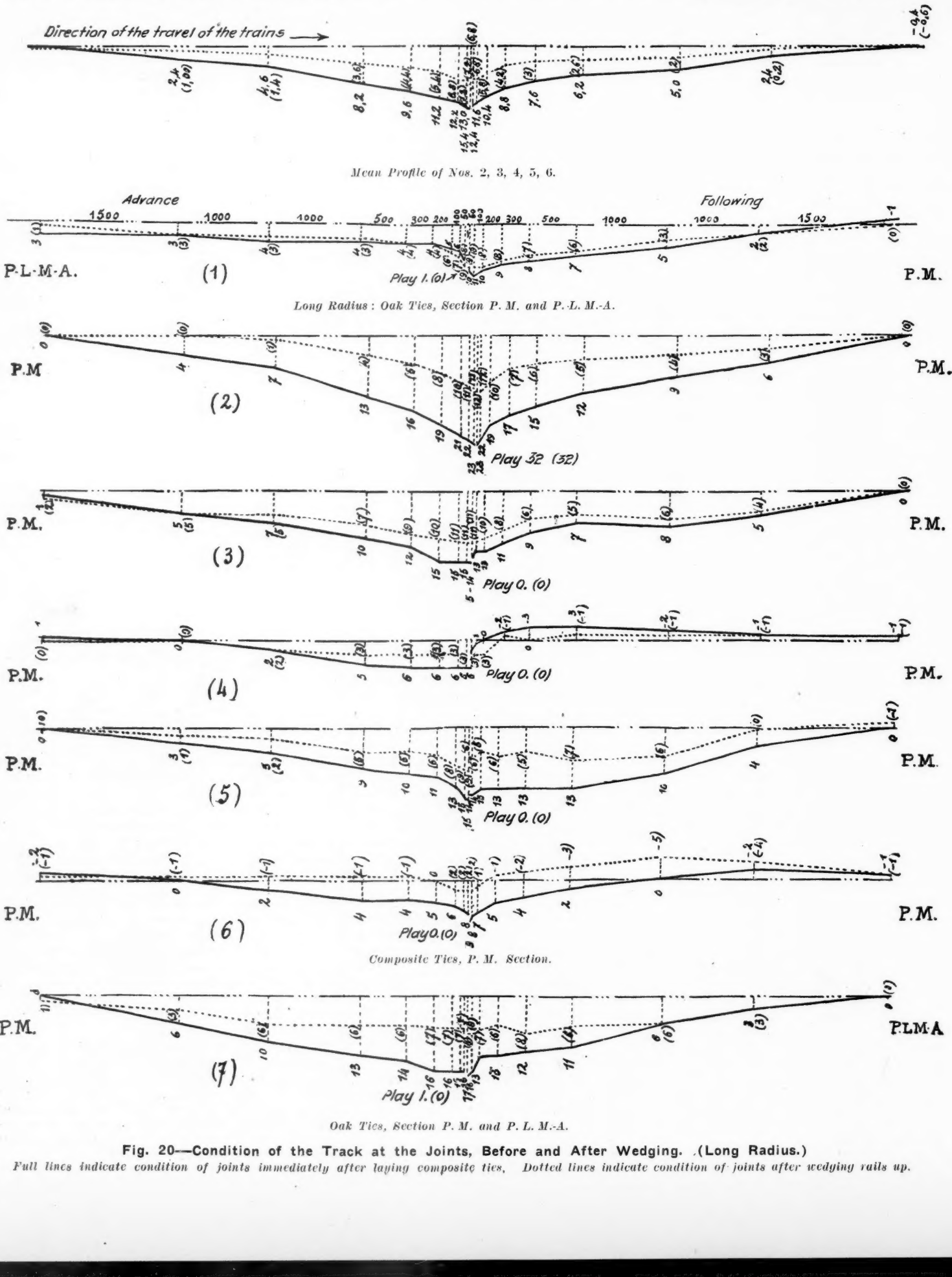


Fig. 20—Condition of the Track at the Joints, Before and After Wedging. (Long Radius.)

Full lines indicate condition of joints immediately after laying composite ties, Dotted lines indicate condition of joints after wedging rails up.

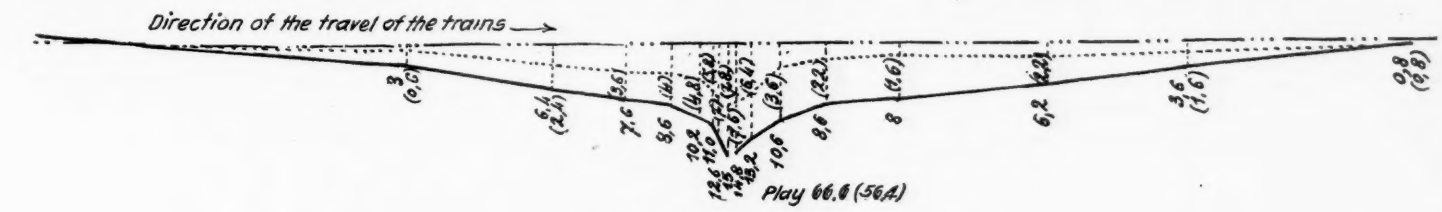
ordinary ties, Fig. 21; that was occasioned by the fact that the P. M. rails, with which the section was provided, were very much worn, after long service.

The experiments were carried on in the following manner: Three cleats were fixed on both sides of the joint, at each of the extremities of the rails, on the upper part of the head. A steel rule placed on rigid supports allowed an estimate of the difference of level between the top of the cleats and the under part of the rule, by means of the wedge gage previously described. The first axle of the engine was brought right at the first cleat, and the profile of the extremities of the rails was observed; then the same operation was repeated by allowing the same axle to advance successively right at each cleat, and the same observation was made.

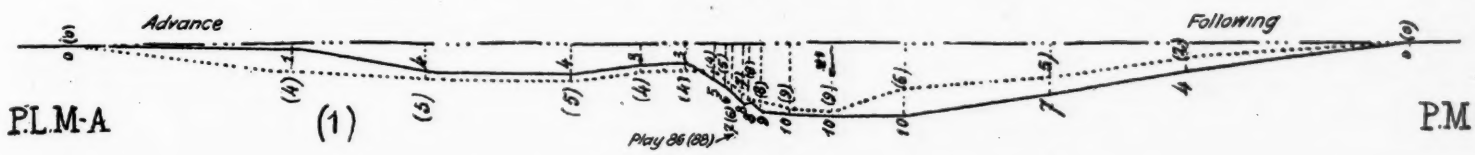
The result of these experiments is given in Fig. 22, in the left part of which are shown the successive sections of profiles of the P. L. M.-A. rails resting on ordinary cross ties; in the right part, the same profiles of P. M. rails supported on composite ties. The full line represents the original profile of the rails, the dotted line the profile deformed by the passage of the vehicle.

The original profile of the P. L. M.-A. rails is quite defective; there is, from the advance end to the following end of the joint, an unequal level of .064 in. at least; at the passage of the load over the joint there is a fall of .06 in. The successive profile of the two rails becomes quite discontinuous and more undulating.

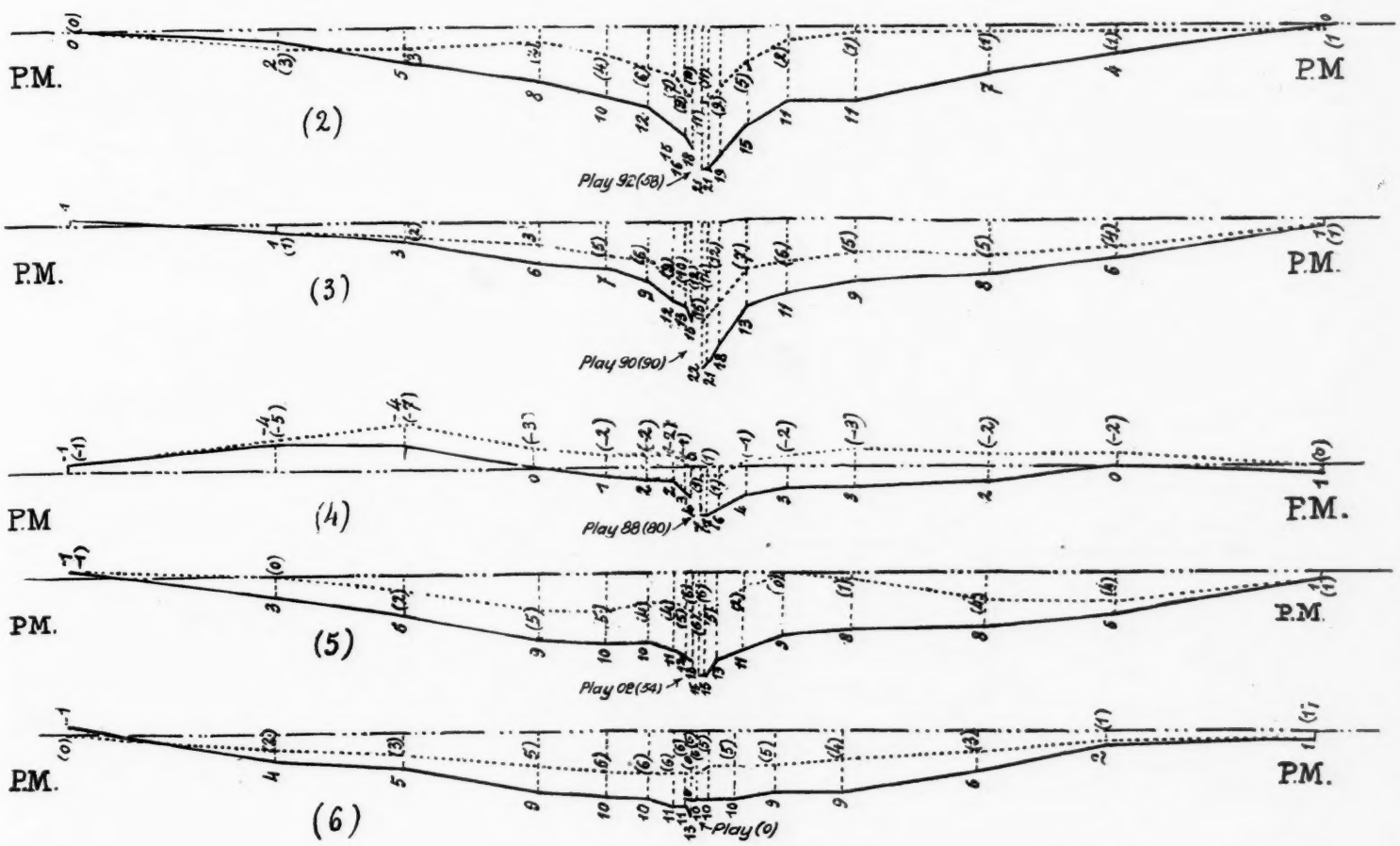
The original profile of the P. M. rails supported on composite ties is better. At the joint there occurs an ascending step, which



Mean Profile of Nos. 2, 3, 4, 5, 6.



Short Radius: Oak Ties, Section P.M. and P. L. M.-A.



Composite Ties, P. M. Section.

Oak Ties, Section P. M. and P. L. M.-A.

Fig. 20—Condition of the Track at the Joints, Before and After Wedging. (Short Radius.)

Full lines indicate condition of joints immediately after laying composite ties. Dotted lines indicate condition of joints after wedging rails up.

is rather unusual. The passage of the load improves the profile, which becomes almost continuous; there is an inequality of scarcely .012 in. when the load passes over the joint.

This is what is to be expected; it will be recalled, moreover, that the longitudinal movement of the track is much less strong when the latter is provided with composite ties, and that the joint does not undergo any oscillation during the passage of a load over the rail. The splicing is not then injured, as in the ordinary case; the shock which is produced is very much diminished by reason of this fact; the following tie is not unwedged, at least as rapidly. The unequal level of the advance end and following end is increased by this unwedging, but the unwedging is also an effect of the oscillatory movement of the track, and it becomes, in consequence, one of the causes for bad condition of the joint. This unwedging causes the tie of the following end of the even joint to bend more than otherwise, which increases the fall still more, due, for the most part, to the unequal wear of the splice bearing points. The composite tie, which distributes equally over the ballast the pressure which it supports, is not exposed, like the ordinary tie, to being unwedged; the fall at the joint ought then to be reduced.

However, it is difficult to make an exact and complete comparison between the results obtained on the track provided with P. L. M.-A. rails and those which have been found on the track provided with P. M. rails. This latter track is much more rigid than the first, and the movements which can be produced are of less importance. Similarly, the weakness should not reach, from this fact, the proportion of 1 to 3; but it is certain that it will be found, and will be as much greater as the tie is larger, and as the oscillatory movement is reduced.

The experiment performed under the conditions pointed out is therefore of importance. The unequal level which is produced by the passage of vehicles from the advance end to the following

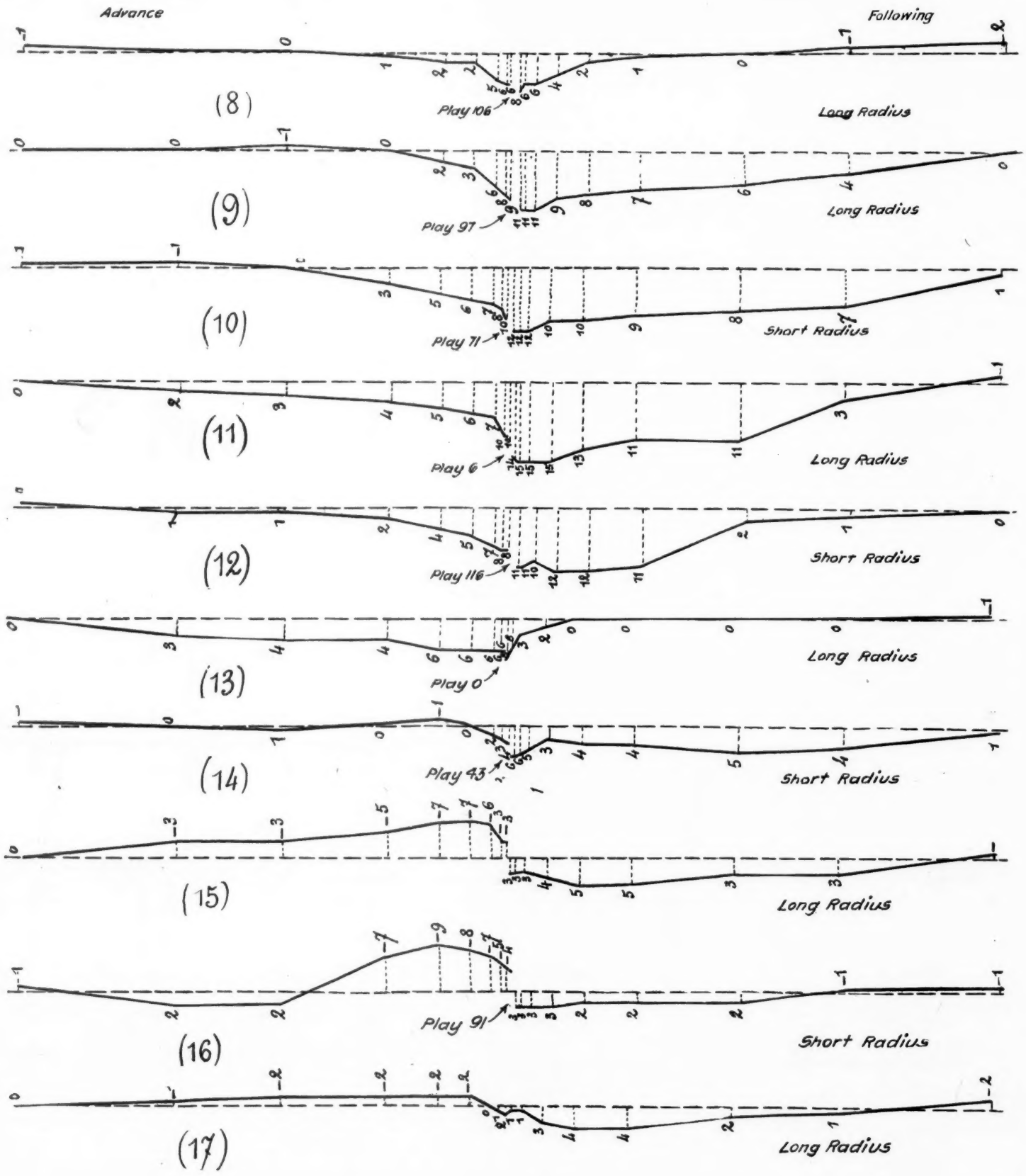


Fig. 21—Condition of the Track at the Joint; Wood Ties.

end has been observed in the static state; it is probable that it is greater in the dynamic state, by reason of the shock which takes place, and which is capable of increasing the movement.

I have not been able to prove it on the experimental track; moreover, the interest of such a measurement would not have been great, for the track conditions on a curve would have vitiated the test, or, at least, rendered it not precise. Nevertheless, I wished to proceed with the measurement of unequal level on track 2 of the line from Lyons to Geneva, particularly stressed and provided with P. M. rails. The ordinary splices, which united the extremities of the rails, presented exactly the aspect pointed out by Mr. Freund; that is to say, the bearing points of the splices were unequally worn, and the notch of the following end, in consequence of the repeated shock, was deeper than the notch of the advance end.

It was necessary, in order to have an exact proof, to photograph results. Mr. Louis Lumière, whose name is well known for his optical studies, established a special apparatus of the most simple kind, which permits registration on a photographic film. This apparatus is composed essentially of two acetylene lanterns at the center of two concave mirrors, each fixed to the extremities of the rails to be tested, and a sensitive film. The housing containing the film and the acetylene lanterns was arranged on a concrete block located about a meter below the track, in such a manner as not to be influenced by the passage of vehicles. The same film registered at the same time the displacement of the advance rail and that of the following rail. The experiment was performed at the passage of a freight train traveling at a maximum speed of 12.4 miles an hour.

Fig. 23 shows the depressions which are manifested at the extremities of the advance rail and following rail at the passage of each of the vehicles; the absolute magnitude of this depression is given by the difference between the position of the horizontal line representing the luminous ray before the passage of the train, and the lower points of the undulating line, determining for each extremity of the rail the oscillatory movement which it assumes at the passage of the train. The influence of each of the axles is clearly noticeable; between two axles the rail tends to raise up.

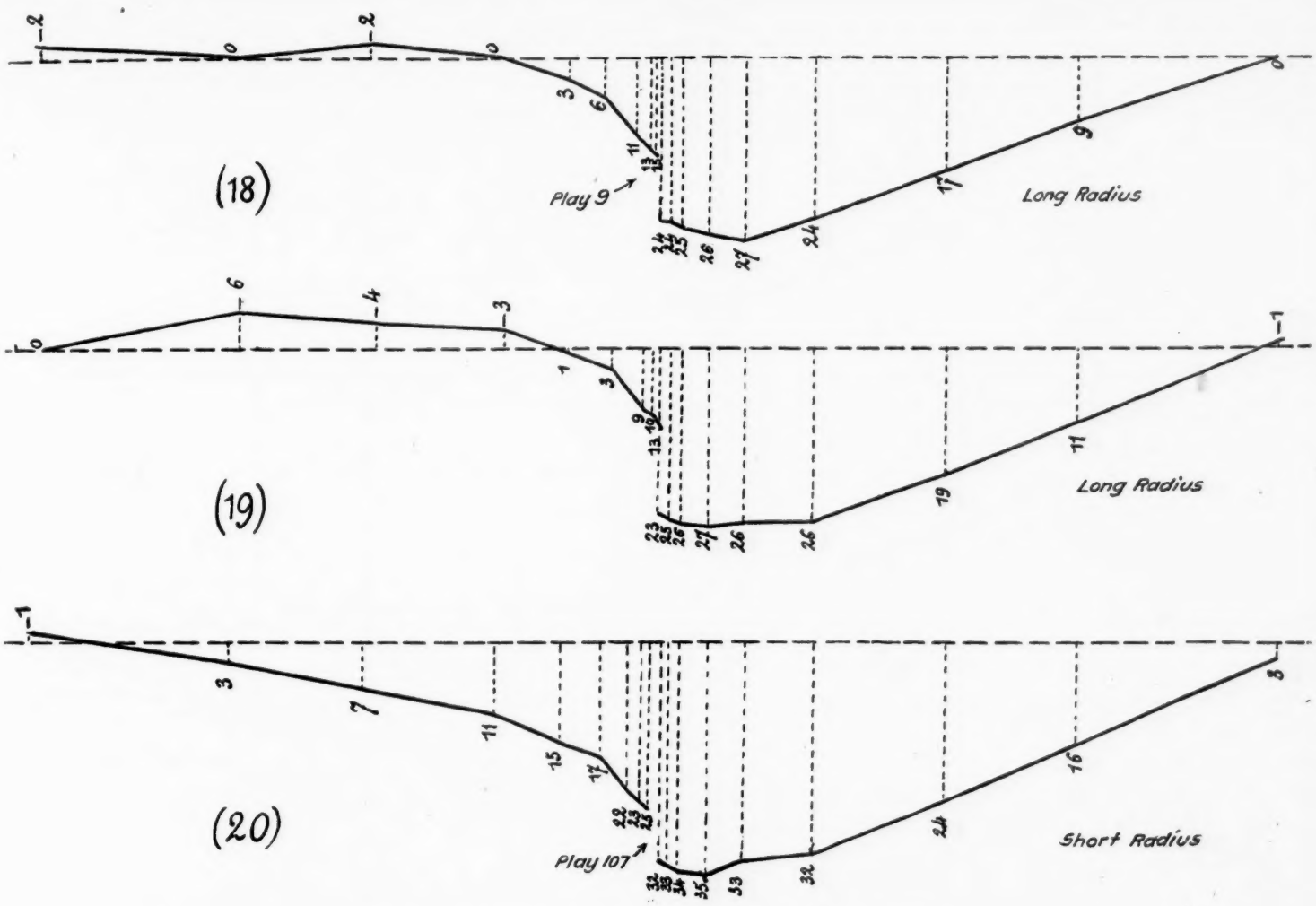


Fig. 21—Condition of the Track at the Joint; Wood Ties.

Fig. 23—Photographic Records of Movement at Joint. Upper Record Magnifies Movement 3.79 Times; Lower Record, 3.91 Times.

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The magnifying at the advance end is 3.91, the magnifying at the following end is 3.79. It results that, after the photographic trace, the extremity of the following rail vibrated 0.35 in., and that the advance rail had a play of 0.14 in. The fall, when passing from the advance to the following rail, would thus be 0.21 in. It is not necessary to remark that this fall is very great, and that it indicates a joint in bad condition. It was thought desirable, in order to try the apparatus, to take a joint of this kind, allowing an appreciable vibration to be obtained. These results are, besides,

comparable with those which are pointed out by Mr. Coüard in his article of July, 1897, on the vertical deformation of the rails (*Revue des Chemins de Fer*), for he estimates that the variable flexure of the rail at its extremity is 0.12 in., and that the compression of the ballast reaches 0.12 in.; the bending which it can take is, then, 0.24 in.

It matters little whether the flexure does or does not reach this limit; it suffices to prove that it is of real importance, and that it ought to be reduced.

(*To be continued.*)

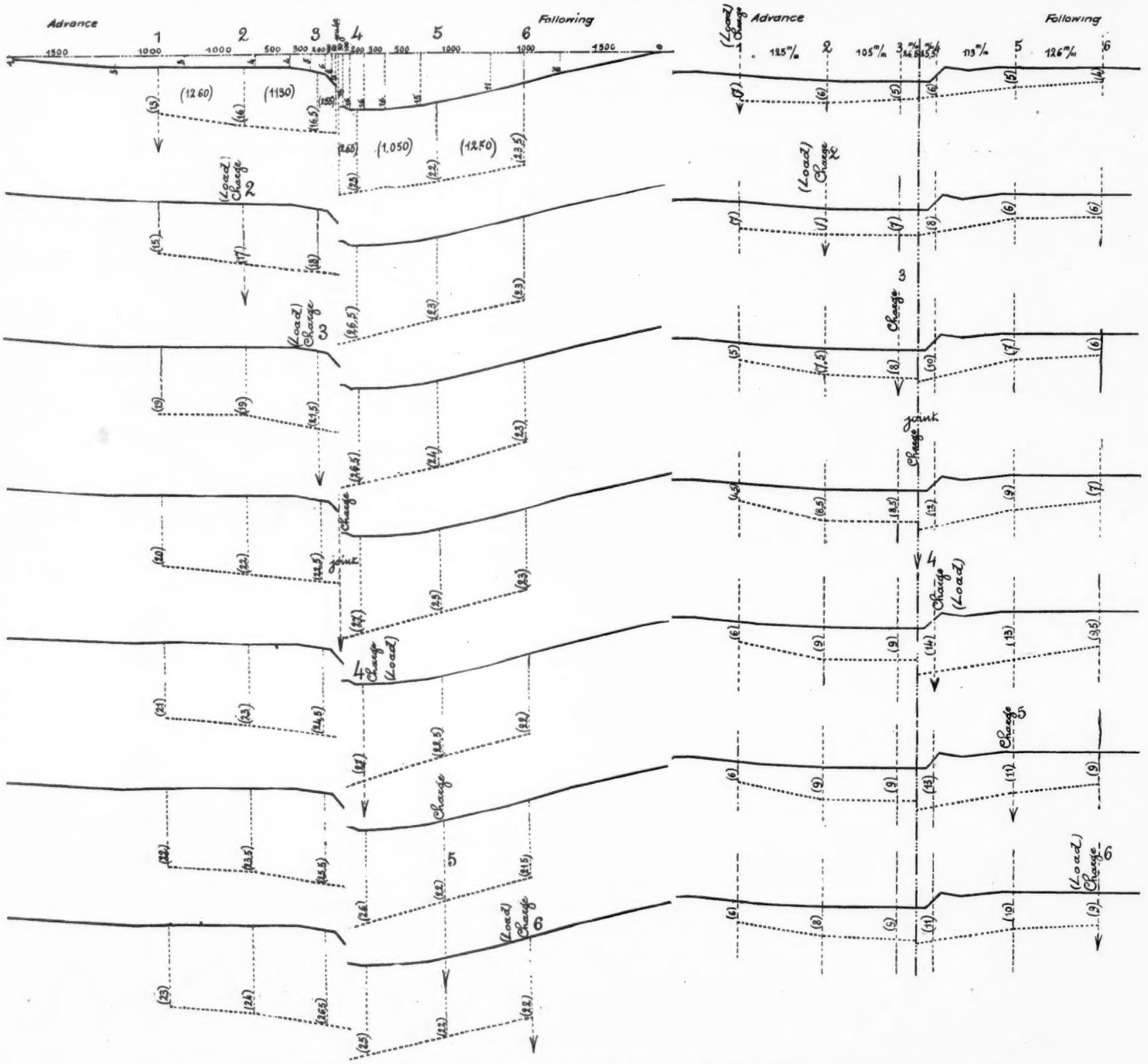


Fig. 22—Depression at the Joint at Passage of Train, Oak Ties, Left Side; Composite Ties, Right Side.

Wisconsin Railroad Commissioners' Report.

The railroad commissioners of the state of Wisconsin, John Barnes, B. H. Meyer and Halford Erickson, have issued the first biennial report of the new commission, which was organized July 11, 1905, under a law which established a new body of three to take the place of the former single commissioner. About half of the present thick volume of 950 pages is filled with statistics of the 50 roads doing business in the state, and most of the remainder is made up of decisions rendered by the commission on complaints of excessive rates and other things. The report proper, which is headed "A General Account of the Work of the Commission," takes only 17 pages.

As far as possible the commission has endeavored to settle complaints by informal conferences, and has encouraged formal complaints only when easier methods failed. The work of these informal conferences is held to be the most important which has been accomplished by the board. The commission has undertaken independent and original investigations of railroad accounts, and of rates and tariffs, both of which involve elaborate studies. Ninety-two formal complaints had been filed up to December 1 last, and 62 of these were disposed of, without a ruling, by informal conferences or correspondence. Important readjustments in rates have been made, and, as the investigation of tariffs proceed more will be made. Information has been gathered (but not yet compiled) concerning railroad sanitation, station facilities, sleeping car and express rates, and the weighing of carload freight. The commission has declined to make a money estimate of the value of the work which it has done, because this would encourage the use of incorrect standards. Important changes have been made in rates on grain, cheese, cattle, coal and lumber, but the direct financial consequences are no more important than the systematic, thorough and continued study of actual conditions which was involved. Moreover, the mere existence of a commission with power to cure wrongs tends strongly to promote fair dealing.

The report recommends that the commission should either have complete jurisdiction over street railways or else have less than now. The line of distinction between city and interurban is not clearly defined. The law concerning the construction of private tracks should be made more definite. The legislature should empower the commission to limit the time in which its orders must be carried out, as, for example, in the construction of station buildings or side tracks. Only one order of the commission, that requiring certain trains to stop at Dwight, Polk County, has been attacked in the courts.

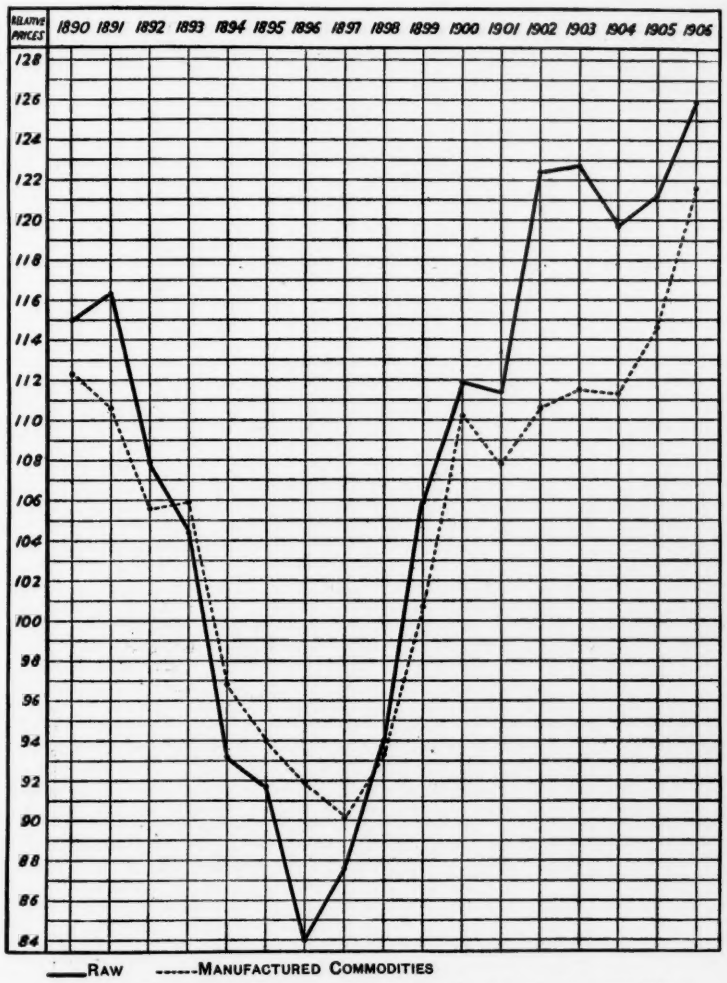
Under the law the railroads have to send to the commission

lists of passes and reduced rate tickets, and in the appendix a statement is given of the newspapers to which the railroads have issued transportation in exchange for advertising, with the value given by each road to each paper. In this statement there are 13 railroads and over 700 papers, and the total sum received by each paper (in the aggregate from all of the roads) varies from $1.05 to $8,444. The Milwaukee *Evening Wisconsin*, which received the latter sum, traveled $3,532 worth on the Milwaukee road, $3,396 worth on the North-Western, $800 on the Wisconsin Central, $664 on the Northern Pacific, and used small amounts on two other roads. The total granted by all of the roads in 12 months and 15 days was $124,390, of which the Milwaukee road contributed $37,266, the North-Western $37,324, and the Illinois Central $2,540.

The commission requires reports of accidents, on blanks which correspond very nearly to those issued by the Interstate Commerce Commission. A representative of the commission visited the scene of two railroad accidents, but it does not appear that any formal report was made. The railroads have filed plans of 12 new interlocking plants since the commission was organized. As the commission had no engineer, these plants were approved subject to future inspection. The former practice in Wisconsin of having these intricate and extensive machines approved by a non-expert is declared to be useless. The commission now has an engineer and has instructed him to correspond with engineers throughout the country to learn what are the best appliances for safety on railroads.

Increased Commodity Costs.

The following diagram, reproduced from the Bulletin of the United States Bureau of Labor for March, 1907, affords perhaps the best single argument for a general increase in freight rates. The curves are compiled painstakingly from the totals of about 260



Relative Prices of Raw and of Manufactured Commodities, 1890-1906.

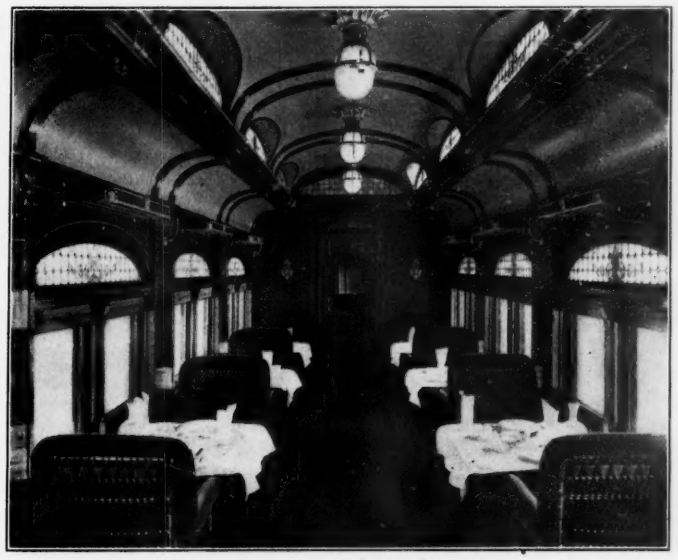
Average price, 1890-1899, *is* 100.

articles, including farm products, food, cloths and clothing, fuel and lighting, metals and implements, lumber and building materials, drugs and chemicals, house furnishing goods, and miscellaneous articles. Wholesale prices only are quoted.

A new organization of the Bavarian State Railroads went into effect in April, when some 900 employees were promoted, and a large number were retired, among them Ebermayer, who had been General Manager since 1895, and was the first to reach this position from the engineer department. The railroads now come under a special general manager, Seiler; construction has a separate manager. The railroads are divided among five managements; there are about 4,700 miles of them.

Combination Parlor, Sleeping and Dining Cars for the Canadian Northern.

The Barney & Smith Car Co., Dayton, Ohio, has recently delivered to the Canadian Northern the first of an order for four combination parlor, sleeping and dining cars built under the patents of the American Palace Car Co., New York. The first car has been named "Balmoral" and the other three will be named "Buckingham," "Windsor" and "Warwick." The general arrangement and finish of the cars are shown in the accompanying illustrations.



Car Arranged for Serving Meals.

They are 72 ft. 6 in. long over end sills, 9 ft. 10½ in. wide over side sills and 14 ft. 6½ in. high over all with a height inside of 6 ft. 9 in. from top of sill to bottom of plate.

At one end is a wide observation platform and an observation room 9 ft. 8 in. long containing six wicker chairs and a sofa which can be made up into an upper and lower berth. Next comes the

Making Up a Section.

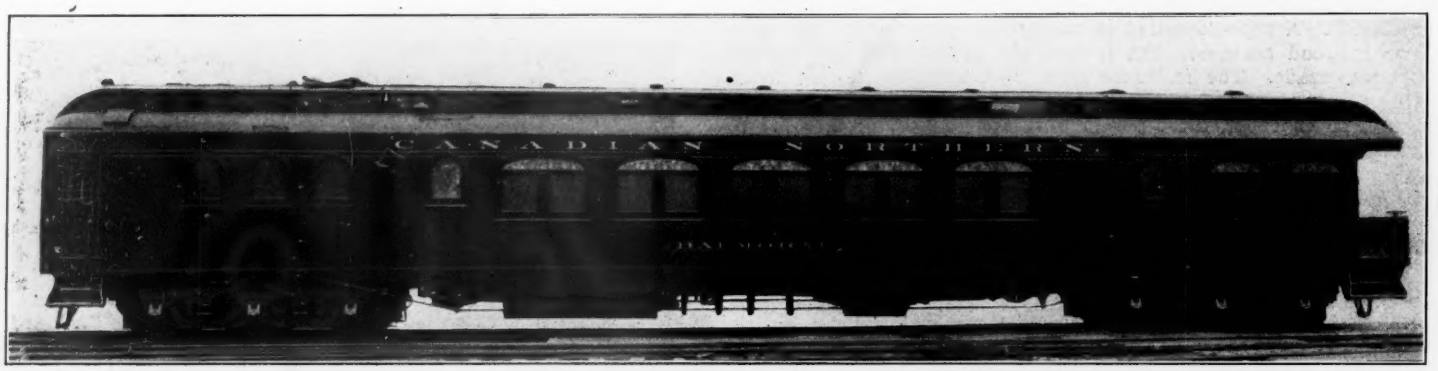
men's toilet and smoking room, 8 ft. 11 in. long, and then the main room, 32 ft. 9¾ in. long. Beyond that are two ladies toilets, one on each side of the passageway, and the large kitchen in the end of the car. The kitchen end has a Pullman wide vestibule.

The feature of particular interest in these cars is the arrangement of berths whereby the car can be quickly converted from a parlor car for day travel into a sleeping car for night travel. There are 20 large upholstered chairs for day use and the berths and bedding are stored in ventilated steel pockets built in the framing below the floor and entirely concealed by the flush trap doors which form the body of the floor. To make up a berth the two chairs over a section are moved to one side and the double trap doors 6 ft. 2 in. long are raised to a vertical position forming the partitions

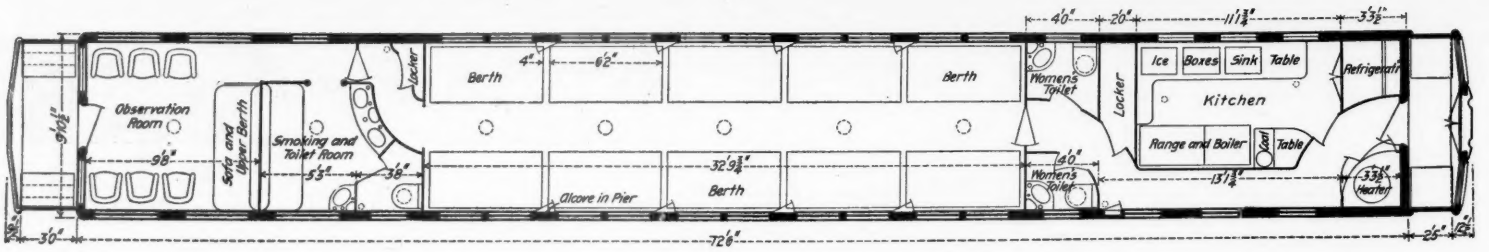
between adjoining sections. The upper and lower berths are then raised out of the pocket to their proper height by means of light wire cables passing over sheaves on the partitions and around a winding drum under the berth pocket. This drum is turned by an extension crank handle passing down to a pinion under the floor, as shown in one of the illustrations. The two berths are raised to their proper height and made up into beds, and the chairs, hand baggage, etc., are stowed away in the pocket under the floor. Berth curtains are hung from a curtain rod carried on hangers which pull out from under the deck. There is 6 in. more headroom in the lower berth than in a Pullman car and the berths are wider. The windows are high and the upper berth is lighted and ventilated from the outside.

are two 9-in. channels forming the inside walls of the berth pockets. The reinforcement of the sills makes unnecessary the use of cross-bearers between bolsters which would interfere with the berth pockets.

The car is finished inside with inlaid polished mahogany except in the kitchen, which is finished in cherry. The ceiling is painted a light olive green with gold decoration and art glass is used in the deck windows and over the side windows. The car is lighted by acetylene gas and heated by steam and in every respect is equipped with the most modern and luxurious fittings. It is understood that this is the first of a large order for these cars which will gradually be put in service on the Mackenzie & Mann system to replace old equipment.



Combination Parlor, Sleeping and Dining Car for the Canadian Northern.



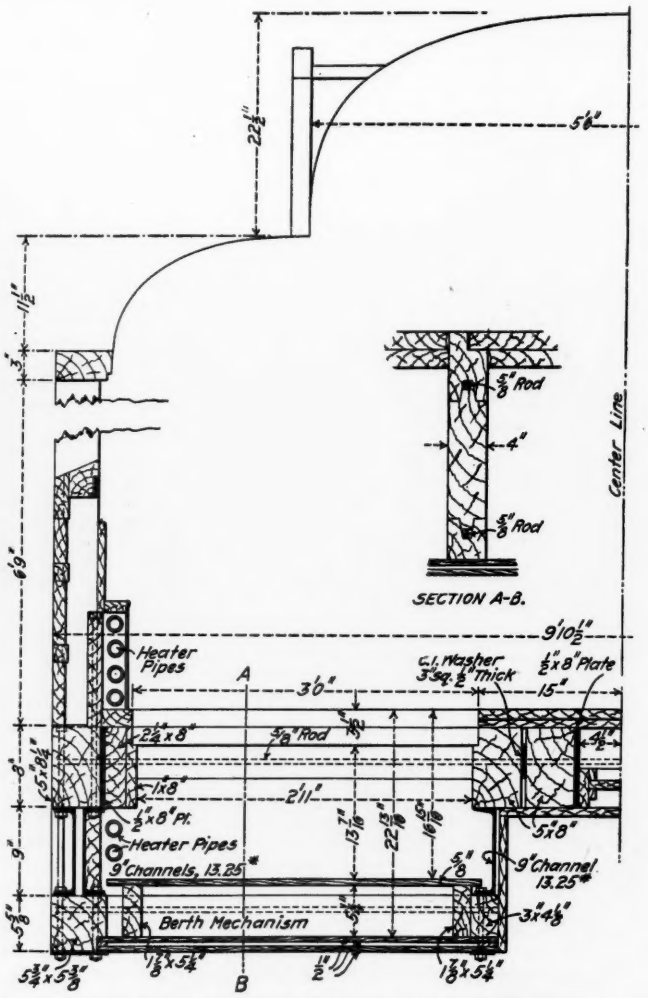
Floor Plan of Combination Parlor, Sleeping and Dining Car for the Canadian Northern.

For use as a dining car, 10 double tables are carried in a large locker next to the kitchen and these are put up when required between each pair of chairs as in a cafe parlor car. Paneled lockers are provided in the wide piers between windows in which table silver is stored when not in use.

The peculiar construction of the berth pockets below the floor

Interior View Showing Two Sections Made Up.

requires a special design of heavy composite underframe. Above the side sills the framing is Barney & Smith standard with a few unimportant modifications. The side sills are made up of three timbers 8 in. deep with a total thickness of 8¼ in. and a ½-in. x 8-in. steel flitch plate. For the length of the berth pockets two 9-in. 13.25-lbs. channels are bolted under the main sill and below these is another timber 5¾ in. x 5⅝ in. The four center sills are continuous from end to end of the car and are made up of 5-in. x 8-in. timbers with two ½-in. x 8-in. flitch plates. Under the center sills



Half Cross Section Showing Under Frame.

GENERAL NEWS SECTION

NOTES.

The legislature of New York has passed a reciprocal demurrage bill.

The Troy Line has decided to build two new steamboats for its Hudson river passenger traffic.

The lower house of the Florida legislature has passed a bill to limit passenger fares in that state to 2½ cents a mile.

Both houses of the New York legislature have passed a 16-hour labor bill for trainmen, similar to the Federal law on this subject.

The Missouri Pacific has made a reduction of 2 cents per 100 lbs. on grain in carloads from points in Kansas to eastern and southern termini.

Press despatches from Denver say that Chairman Knapp and Commissioner Neill have been asked to come to that city to arbitrate a dispute between the Denver & Rio Grande and its trainmen, who are asking for higher wages.

On April 22 the Governor of Pennsylvania signed the bill authorizing street railroads in that state to carry freight; and 12 hours afterward the Philadelphia & Westchester Traction Company started a car loaded with milk for Philadelphia.

The railroads of Minnesota have decided to discontinue all tourist, charity, clergymen and mileage tickets, and to sell all tickets at the legal rate of 2 cents a mile, which went into effect May 1. "All excursion rates are abolished," the reports say; but for how long?

The State Railroad Commission of Ohio announces that it will no longer allow railroads, in making excursion fares, to include in their estimate of the value of the service, the cost of hauling empty cars from headquarters to the point whence the excursion starts and back to headquarters after the excursion trip has been made.

At a hearing before a committee of the Connecticut legislature in Hartford last week a number of telegraph operators testified that it was common for operators in station offices to work 36 hours continuously. L. H. Dowe, of Danbury, said that within the past three years he had done this probably a dozen times. It was stated that on the Shore line division men worked 24 hours a day once or twice a week.

Chicago papers say that the Chicago, Burlington & Quincy has given notice of withdrawal from the Chicago Car Service (demurrage) Association. It is understood to be the purpose of the Burlington to organize a car service association, publish its car service charges and collect them as rigorously as freight rates are collected. In this way only, it is believed, can demurrage be collected without conflict with the law.

The railroad commissioners of Ohio have decided that where a steam railroad makes reduced fares to meet the competition of electric lines it must give fair treatment to all towns affected. The Hocking Valley issued what it called a twin ticket, good for a round trip for one person, or for rides one way for two persons; and confined the ticket to two or three towns where the competition was particularly felt; but the commissioners say that the reduction must be granted to certain other stations in the same vicinity.

Passenger conductors on the Burlington road are to wear buff vests this summer, as heretofore, but the story that all would be required to have their faces clean shaven appears to have been invented by a reporter who was dreaming, or was making an unusual effort to fill up the space allotted to him for that day. The company does not object to whiskers, but the superintendents will insist that each conductor be "either one thing or the other." If he wears a beard, all right; but if he does not wear one, he must not be seen with "near whiskers."

The South Manchuria Railway.

The plans for the South Manchuria Railway were briefly mentioned in the *Railroad Gazette* of February 1. The extension of the Seoul-Fusan to Wiji on the Yalu river—which separates Corea from Manchuria—is to be built on to Mukden, about 700 miles from Wiji. Work on the first 100 miles has already begun. The rails have been ordered from the United States Steel Products Export Company, which is the foreign-trade branch of the United States Steel Corporation. The contract, which was secured through the New York offices of the Japanese contracting firm of Okura & Company, calls for about 13,000 tons of 75-lb. rails. Deliveries will extend from May to September. From Mukden the line will run north to Harbin, where it will join the Chinese Eastern Railroad, thus getting connection with the Trans-Siberian. South from Mukden, the South Manchuria will be built to Dalny, on the seaboard near Port Arthur. From Harbin to Dalny is 800 miles, so that, including the Wiji-Mukden line, fully 1,500 miles of new standard gage road will be built. Nearly all the rails, bridge material, locomotives and cars will be bought in the United States. Some particulars of the contracts so far placed have been printed from time to time in the *Railroad Gazette*. The entire system will cost, it is estimated, nearly $100,000,000 gold, and by the terms of the Japanese-Chinese treaty it must be finished inside of two years.

Two-Cent Fares in Virginia.

The State Corporation Commission of Virginia, on April 27, issued an order requiring that from July 1 the principal roads of the state limit all passenger fares to 2 cents a mile. The Norfolk, Franklin and Claremont divisions of the Southern are allowed to charge 2½ cents; the Norfolk & Southern and 10 other roads doing a light business are allowed to charge 3 cents, and 12 other small companies 3½ cents.

Loading 150,000 Cars a Day.

At the second annual dinner of the Transportation Association of Milwaukee May 2, Mr. Arthur Hale made a brief address, in which he said: When the newspaper men discovered the freight car last fall they were very much surprised to find that, on an average, it made little more than 24 miles a day. The discussion of this question has done a good deal of good, but there would have been a better understanding of the subject if a little more consideration were given to the exact meaning of an average. I am glad to be able to say that in the first half of 1906 the railroads of the country showed marked improvement. The best figure that I know for 1905 is 24.8. For the first six months of 1906 this rate was raised to 25.7. Probably it would have been better to have said that our freight cars made 9,000 or 9,500 miles a year. If you can personify a fine young freight car, just out from the shops near Chicago, you can imagine his scorn of the 25-mile-a-day record held by some of the old cars which he first associates with, and if the new car makes its first trip, say from Chicago to New York on a 60-hour freight train, it will make a record of well over 300 miles a day for its first three days of existence. It may be loaded back to Chicago on another fast train, but it is much more probable that it will be loaded in local service, where its rate per day would be very much lower. If, for instance, the car is loaded back from New York to Newark, New Jersey, it can only make 8 miles that day, and if the consignee is not in a hurry for his freight and if a Sunday and holiday intervene, even the rate of 8 miles a day may be reduced to 3 or possibly 2 miles a day. An error in a shipper's invoice or an error by a bill clerk may keep the car standing for days or weeks, when its record will be nothing a day, and it will not take many weeks of such ordinary handling to reduce our new car's first record to the average.

Much can be done to improve matters, much is being done, and much more will be done. The Interstate Commission is leading the way by pressing the railroads and the public to do their best in the matter. The railroads have doubled their per diem rate of car hire as between themselves; they are following up their own delays better than ever before, and they are buying more cars than ever before. On the other hand, the public is handling cars quicker and is accepting with more favor the various plans devised to penalize delays. An increase of one mile a day means an increase of 80,000 or 100,000 cars in this country, and that number of new cars would cost the railroads nearly $100,000,000, or, putting it in another way, an increase of one mile a day means an increase of 4 or 5 per cent. in the cars available for loading every day. My estimate is that the country loads about 150,000 cars a day, and this meagre increase of one mile means, therefore, an increase in the country of 6,000 or 7,000 carloads a day. The railroads are adding to their equipment this year nearly 200,000 cars.

Guatemalan Railroad.

Sir William Van Horne, who recently returned from Guatemala, made an inspection of the railroad being built from Porto Barrios, on the Atlantic coast, to Guatemala City. He stated that less than 30 miles of rail out of a total length of 194 miles remains to be laid. It is expected to have the line in operation within four months. The new line will bring Guatemala City within two and a half days of New Orleans and five days of New York. The United Fruit Company is building three steamships to ply between Porto Barrios and New Orleans in connection with this line, and the Hamburg-American company also intends to establish a line between Porto Barrios, New York and Europe. Work on the road was

begun about 15 years ago under President Barrios, but after 135 miles of the line had been built was abandoned, leaving the difficult work of crossing the Cordilleras unfinished. The successful execution of this work was brought about by private capital, the funds being furnished by a syndicate, the leading members of which were Sir William Van Horne, General Thomas H. Hubbard, President of the Pacific Improvement Company, and Minor C. Keith, of the United Fruit Company. The road is held by a New Jersey corporation, called the Guatemala Railway Company, and so far about $12,000,000 has been spent on construction.

Export Rates Must be Published and Adhered To.

In the United States Circuit Court of Appeals at St. Paul April 29, Judge Sanborn affirmed the judgments of the United States District Court for the Western District of Missouri against the Armour Packing Company, Swift & Co., Morris & Co. and the Cudahy Packing Company for accepting concessions of 12 cents per 100 lbs. on provisions from Kansas City to Christiania and other points in foreign countries. Judges Hook and Adams concurred in the opinion. The lower court (Judge McPherson at Kansas City June 22) imposed a penalty of $15,000 on each of the indicted firms, and these fines are affirmed. The substance of the conclusions reached by the court are:

The giving or receiving of a rebate or concession whereby property in interstate or foreign commerce is transported at a less rate than that legally filed and published is a violation of the law of 1903, and is a continuous crime, adjudicable in any court of the United States having jurisdiction of any district through which transportation is conducted. Rates from places in the United States to ports of transshipment, and from ports of entry to places in the United States, of property in foreign commerce carried under through bills of lading are required to be filed and published. If carried under an aggregate through rate, which is the sum of the ocean rate and the rate from or to a place in the United States to or from the port of transshipment or of entry, the latter rate is required to be filed and published.

If carried under a joint through rate the joint rate is required to be filed and published. The "device" by which the concession is brought about is not an essential element of the crime, and it is unnecessary to plead it in the indictment.

A contract by a carrier and a shipper to transport the latter's goods in interstate or foreign commerce at the then established rate for a definite time is ineffective after a higher rate has been filed and published, as required by law. The time during which a rate different from the agreed rate is established by filing and publishing is excepted from the term of such contract by virtue of the national acts to regulate commerce which are a part thereof. Such a contract constitutes no defense to a charge of giving or receiving a rebate or concession from the filed and published rate.

The only criminal intent requisite to a conviction of an offense created by statute which is not *malum in se* is the purpose to do the act in violation of the statute. No moral turpitude or wicked intent is essential to a conviction of such a crime.

The defendants in this case were indicted by the Federal Grand Jury in Kansas on December 15, 1905. The Grand Jury also indicted three railroads and several officers. The officers were charged with conspiracy and the railroads with giving rebates. These cases are pending before the United States Circuit Court of Appeals.

Good Advice from the Erie Employees' Magazine.

Hook up the handles of your station trucks and keep them out of the way of passengers when the trucks are not in use. Passengers have an awkward habit of tumbling over trucks when these are left about unloaded.

Station agents should remember that it helps rather than hurts to have bulletin boards accurate when trains are late.

If United States mail pouches are short be sure to issue a shortage slip to cover. Make reports of handling on forms 909 and 910 complete in every detail. If not, the company is fined by the Post Office Department.

If a shipper cannot load a car in 24 hours or 48 hours at the extreme limit, give it to the next shipper, or, if there are no other shippers ready, promptly report it as not wanted. Don't hold it for loading on the "bad roads" excuse.

It cost this company about $1,000 in three months because agents loading cars for points on the C. N. E. via Campbell Hall did not bear in mind the fact that some of the cars exceeded the clearances of that road. A trifling effort to insure loading for such transfer points of only such cars as will clear would have obviated delay and the expense of transferring.

Remember that a car with drawbar out should never be hauled with chains beyond the sidetrack nearest the point of accident, care being taken never to block passing sidings. If the car contains live stock or perishable freight it should be repaired very promptly or the freight transferred at once.

The Cook Improved Track Drill.

Several improvements have recently been made in the mechanism of the Cook standard track drill shown herewith. The ball-bearings of this tool, as it is now made, are encased in highly tempered tool steel "racers." They are self contained so that the balls cannot be lost out of the racers when the bearings are put on or taken off; the bearings are held in place by a set screw. Using these bearings to absorb the thrust eliminates the cutting of the thrust bearing, which is a common drill trouble, the friction at the thrust point being greatly lessened as the power exerted on the handles of the drill can be used at the bit point in cutting through the rail, and not lost in the drill mechanism. To further absorb the bit thrust and reduce friction to a minimum, a square nut, internally threaded to fit the feed screw, is adapted to take the thrust. The ratchet wheel (heretofore held as if in a vise) being thus relieved of carrying the thrust, revolves easily and prolongs the life of the pawls, cam, the forks at the end of the "walking beam" or arm, the gears, and all other wearing parts. Another feature of the improved form is the "quick return" of the drill bit. This is accomplished

Fig. 1—Cook Improved Track Drill in Working Position.

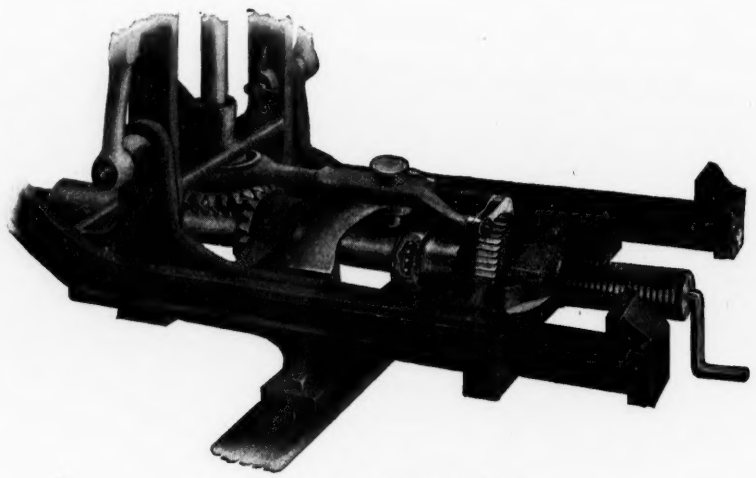


Fig. 2—Details of Cook Drill.

by means of a crank at the end of the feeding screw whereby the drill bit may be quickly screwed up to the work, or returned, as desired. The rapidity with which the spindle can be moved forward or back renders it unnecessary to collapse the drill, except when trains are actually passing on the track. The Cook

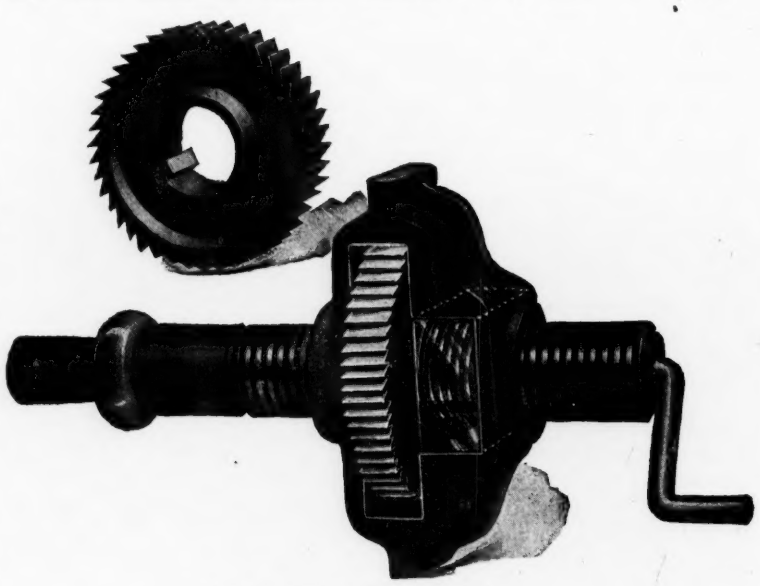


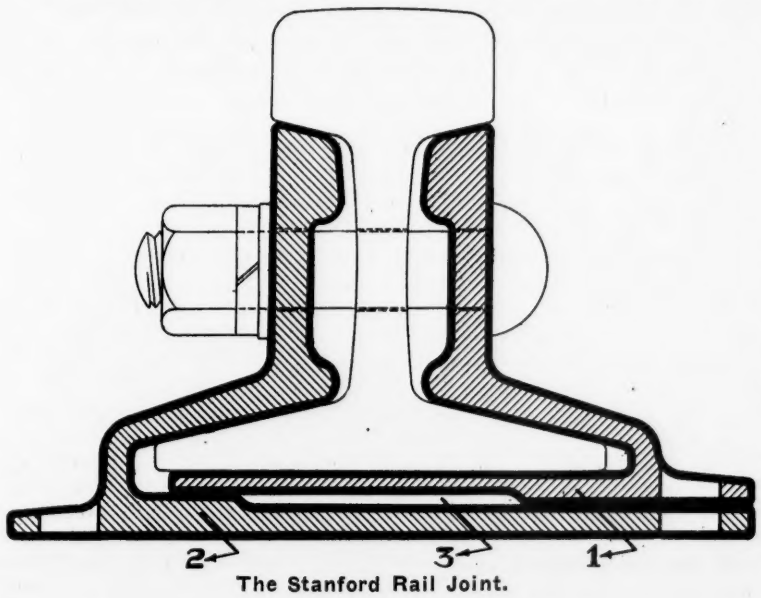
Fig. 3—Quick Return Device.

standard track drill is made by Cook's Standard Tool Co., Kalamazoo, Mich. The H. A. Rogers Company, dealers in railroad and machinists supplies, 19 John street, New York City, are the exclusive selling agents in the eastern and southern states.

The Stanford Rail Joint.

A new form of rail joint has been devised by Arthur L. Stanford, Chicago. The inventor describes it substantially as follows:

By means of recess 3 the rail brace and splice-bar flange 1 are deprived of direct support, and their elasticity is developed by bending nearly to, but not exceeding, the elastic limit, thus in a measure protecting the rail tread from injury by the hammering of the car wheels. Also, due to this same recess, there is no bearing between the two splice bars, 1 and 2, at the central part, likewise developing the elasticity of bar 2 and further protecting the tread



The Stanford Rail Joint.

from battering. The attainment of this object yields longer life to the rail and lessens breakage, noise, damage to rolling stock, cost of maintenance, etc.

The base flanges 1 and 2 overlap, each therefore carrying the entire weight and being thereby interlocked by friction. This produces in effect a one-piece joint. The splice-bar flanges are given equal offsets, making each stronger near the web. The location of the recess 3 is such that when the two bars are unified by friction a desirable structural shape is provided. It is, therefore, claimed that for equal weights of metal this form of rail joint is the strongest made. Other advantages are: The wide thin base flanges, being more or less flexible, will accommodate themselves to each other and to the rail, and slight variations in thickness are minimized in effect. The holding power of the spikes on both sides of the joint is utilized to resist flange pressure, without adding to the tensile stresses in the track bolts. Unification by friction of base flanges 1 and 2 tends mutually to lower the neutral axes of the two bars. The lower base flange provides a satisfactory form of tie plate. The design is considered to possess the advantages of three-piece joints without their complexity. Mr. Stanford's office is in the Railway Exchange, Chicago.

Must Run Trains at a Loss.

The Supreme Court of the United States has decided in effect that the railroad commissioners of North Carolina can compel a railroad company so to adjust its time tables as to accommodate passengers on other lines even if the service is unprofitable. The opinion was delivered by Justice White in the case of the Atlantic Coast Line vs. the Corporation Commission. An order was issued by the commissioners directing the railroad to make connection at Selma at 2:25 p. m. with a train on another line running from the eastern part of the state, with the object of accommodating passengers whose destination was Raleigh. The railroad company resisted the order as it necessitated a special train. This, it was contended, amounted to taking property without due process of law. The Supreme Court of North Carolina held against the railroad company, and its decision is now affirmed. Justice White discussed the contention of the road that the case involved rates and said:

In a case involving the validity of an order enforcing a scheme of maximum rates of course the finding that the enforcement of such scheme will not produce an adequate return from the operation of the railroad, in and of itself, demonstrates the unreasonableness of the order, even if the rules applicable to an entire rate scheme were to be here applied; but as the findings made below as to the net earnings constrain us to conclude that adequate remuneration would result from the general operation of the rates in force even allowing for any loss occasioned by the running of the extra train in question, it follows that the order would not be unreasonable. The distinction between an order directing a carrier to furnish a facility and an order fixing rates as the primal duty of a carrier is to furnish adequate facilities to the public, that duty may well be compelled although by doing so as an incident some pecuniary loss from rendering such service may result. Of course, the fact that the furnishing of a necessary facility ordered may occasion an incidental pecuniary loss is an important criterion to be taken into view in determining the reasonableness of the order, but it is not the only one.

Mexican Street Car Conductors.

In the waiting room of the electric lines in the City of Mexico was one of these two-bit porcelain cuspidors chained to a staple in the floor and padlocked. I saw the necessity of such precaution when I inspected the car service. As a car leaves the barn a fellow called the "caredor," or something like that, takes a receipt from the conductor for everything in the car. Any parts missing when the car comes back into the barn are charged to the conductor. I saw a fellow docked for a missing brass rod from a curtain. The conductor on the shift before him got away with it. Another conductor had unscrewed a brass handle off a door to sell somewhere. The company was losing 2,500 electric globes a month; conductors sell them and report them as broken. Now all globe sockets are etched with acid and must be returned to prove breakage.

They have no such thing as a cash register on a street car in Mexico. Each conductor carries a small book, from which he tears a little ticket and hands it to a passenger as a sort of receipt for his fare. To encourage the public to ask for these coupons they are good as lottery tickets at the monthly drawing, when $2,500 is distributed in prizes. So most of the passengers save their tickets. The conductors, however, have a way of telling the peons, "Six cents with a lottery ticket, 4 cents without," and then they pocket the 4 cents. They have also issued counterfeit tickets and pocketed the fares.

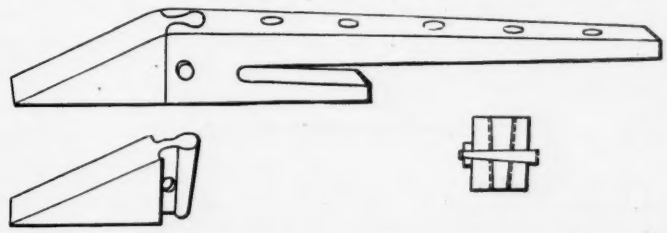
Mexican conductors are paid 10 cents an hour (Mexican money); the motormen 22 cents an hour from the fifth year on. The conductor, however, is never paid any more than 10 cents an hour, because his job is full of good chances. One reason that the motorman gets so much more pay is that he spends about half his time in jail. Every time there is an accident the motorman is arrested and jailed until the case is settled, but the company never has to pay any damages.—*Electric Traction Weekly.*

Consolidation of Morse Lines.

Four of the Morse steamship lines are to be consolidated under the name Consolidated Steamship Co., which was recently incorporated. The Ward Line and the New York & Porto Rico Steamship Co. will be merged later. For each 100 shares of stock of the old companies, 100 shares of stock and 10 collateral trust 4 per cent. bonds of the new company will be exchanged. The four companies are: The Eastern Steamship Co., which has $3,000,000 capital stock; the Metropolitan Steamship Co., $3,000,000 stock; the Clyde Steamship Co., $14,000,000 stock, and the Mallory Line, $14,000,000 stock.

Treacy Detachable-Point Dipper Tooth for Steam Shovels.

The Treacy detachable-point, steam-shovel dipper tooth is illustrated herewith. These points are made of solid steel, and may be re-sharpened or pointed when worn. Points can be changed quickly, new or re-sharpened points being substituted for dull ones, which may thus be sharpened without delay to the work of the shovel.



Treacy Detachable-Point Dipper Tooth for Steam Shovels.

The point is self-locking, there being no bolts. A taper pin is driven through the joint to prevent accidental separation. The joint is claimed to be perfectly rigid and as strong as if solid. The teeth are made of open-hearth cast steel, and are furnished with points of manganese or crucible cast steel for hard rock digging.

A chief advantage claimed for the detachable points is lessened cost of repairs. It is unnecessary to remove the base of the tooth from the dipper, and where an extra set of points is kept ready the shovel can be kept constantly in service. The teeth are made in any size for all makes of shovels. Benjamin C. Bradford, St. Paul, Minn., is General Sales Agent.

Passengers Versus Grain.

One passenger going through Boston is worth more to the community than the transmission of 100,000 bushels of grain. The passenger spends some money in the city, and is, therefore, of some benefit. During the past five years the passenger traffic has increased wonderfully. In 1900, 15,328 first class passengers, and 40,905 steerage passengers passed through Boston. In 1905 there were 25,850 and 101,706 respectively.—*E. Van Etten.*

Automatic Block Signals on the N. O. & N. E.

President Harvey, of the New Orleans & North-eastern, says that the lines of that road and of its affiliated companies, the Alabama & Vicksburg, and the Vicksburg, Shreveport & Pacific, are to be equipped with automatic block signals. It is the intention to erect signals on about 30 miles a year until the work is finished.

Iron Fencing for Railroads.

A substantial design of iron fence for retaining walls is shown in Fig. 1 herewith. It is made of a special three-rib steel channel rail, the third rib being placed to give additional strength where most needed. Fig. 2 is a design of inter-track and park fencing, in which the same channel rail is used. The picket heads are made of malleable iron to prevent possibility of breakage. Both designs are products of The Stewart Iron Works Co., Cincinnati, Ohio, which has a patent on the three-rib steel channel rail. Users of this fencing include the New York Central Lines, the Pennsylvania, the Chicago & North-Western, the Southern, the Illinois Central, the Lehigh Valley, the Mexican Central and the Louisville & Nashville. In addition to iron fencing the company makes wire and iron wickets, grilles, window guards, office and depot railings, folding gates, lamp standards and similar railroad equipment.

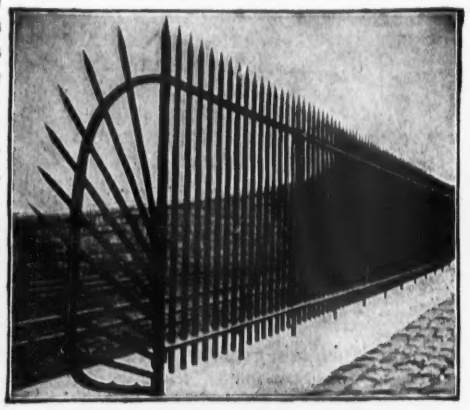


Fig. 1—Fence for Retaining Wall.

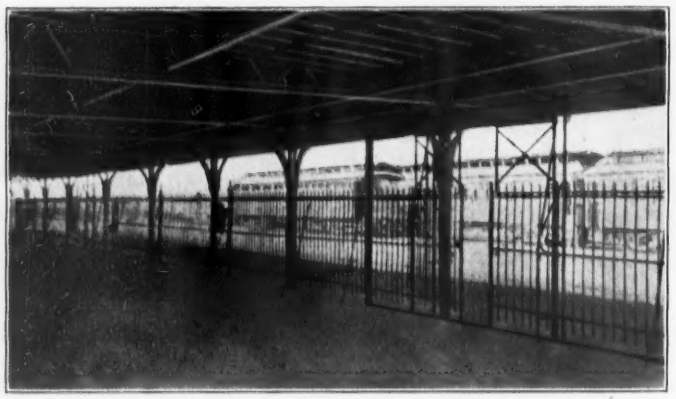


Fig. 2—Inter-Track Fence; Stewart Iron Works.

Sleeping Franchises in New York.

Governor Hughes, of New York, has vetoed a bill which would have extended the time in which the Davenport, Middleburg & Durham Railroad Company might begin the construction of its road. The Governor is opposed to the extension of so-called "sleeping" railroad franchises except for strong reasons. The road was incorporated in 1892. It was required to begin construction and expend thereon 10 per cent. of its capital within five years and to complete the road within 10 years. It has had two extensions, but construction has not yet been commenced. The Governor says: "The franchise to be a railroad corporation and to construct and operate a railroad is not to be regarded as a bounty conferred without reciprocal obligations, but is permitted in view of a supposed public interest and upon the condition that the railroad shall be begun and completed within the prescribed time. This is an important policy, and it should not be nullified by the grant of extensions unless exceptional circumstances demand them. No such circumstances are shown in this case."

TRADE CATALOGUES.

The Obermayer Bulletin.—The latest number of the bi-monthly magazine of The S. Obermayer Co., Cincinnati, Ohio, contains as special articles, a continuation of the series on "The Right Way to Run a Foundry"; "Shrinkage and Contraction"; "Where Should the Blame Rest?" having reference to the trouble known as "seaming" or "rat-tailing"; and "Foundry Practice." There are also other articles and notes of interest in the line of foundry information.

Manufacturing and Business.

The Russell Car & Snow Plow Co., Ridgway, Pa., has arranged to be represented in the east by Wendell & MacDuffie, 26 Cortlandt street, New York City.

The Lehigh Valley Railroad has moved its western passenger office from 218 South Clark street to 203 South Clark street, Chicago. The new office is in the new building of the Commercial National Trust Company, northeast corner of Adams and Clark streets, the center of the railroad and business district of the city.

The Lock Joint Pipe Co., 346 Broadway, New York, has received the following orders from railroads for the protection of tidewater piling: Charlotte Harbor & Northern, all bridges and docks between Hull and Gasparilla, Florida; Pennsylvania, Barnegat Bay bridge; Norfolk & Southern, the two transfer bridges at Winthrop and Oriental, N. C.

W. M. Vandersluis has been appointed Signal Engineer and Superintendent of Construction of the Western district of the Union Switch & Signal Co., with office at 1535 Monadnock block, Chicago, succeeding W. E. Foster, appointed Engineer Assistant to the General Manager at the general office at Swissvale, Pa. Mr. Vandersluis is a graduate of the University of Michigan. He was signal inspector on the Pennsylvania Lines West of Pittsburg for four years, and on the Harriman lines for about a year, and was Signal Engineer of the Big Four before going to the Union Switch & Signal Company. He is 27 years old.

Iron and Steel.

There is a demand for about 250,000 tons of pig iron, and the price has been advanced $2 a ton during the past week. The indications are that pig iron will be scarce, and the price further advanced.

The Carnegie Steel Company, it is said, has given an order to the American Bridge Co. for 6,500 tons of structural steel for a new open hearth mill. During April the orders received by the American Bridge Co. will aggregate probably more than 50,000 tons, and it is expected that May will be still heavier.

The Japanese Government, through Okura & Co., 11 Broadway, New York, its representatives in this country, has ordered from the United States Steel Corporation 75-lb. rails for 100 miles of the South Manchuria Railway, with fastenings, a total of about 13,000 tons. The price was $29 a ton at the mills, which is the highest paid by foreign buyers in a number of years. The contract requires delivery to begin in May.

A number of rail contracts have closed here this week on foreign account. They comprise orders from China, Mexico, Cuba, etc., aggregating 13,400 tons.

The United States Steel Products Export Company—the foreign branch of the United States Steel Corporation—secured a contract for 3,000 tons for use in the construction of the Yekkan Railway, China. Another requisition is for 5,000 tons for the Mexican Central, while 4,000 tons have been ordered for Pamana. The Pennsylvania Steel Company has an order for 1,400 tons, to be shipped to Cuba for a railroad to be built on the Stewart Sugar Company's plantation, formerly the property of the Silveira Sugar Co., in which J. M. Ceballos & Co. and associates were the dominant factors.

OBITUARY NOTICES.

N. T. Smith, Treasurer of the Southern Pacific, died on April 23 at his home at San Carlos, Cal. Mr. Smith was born in 1829 at Schodack, N. Y. He was made cashier and paymaster of the Southern Pacific Railroad in 1871, and five years later was appointed Treasurer. In 1885 he was appointed also Assistant Treasurer of the Southern Pacific Company, and since 1892 he has been Treasurer of both companies.

E. G. Russell, Executive Agent of the Grand Trunk Pacific in British Columbia, shot himself on April 25 at Prince Rupert, B. C. Mr. Russell was born in 1858 at St. George, N. B., and began railroad work in 1874 as a telegraph operator on the Minnesota & Northwestern, now part of the Chicago, Milwaukee & St. Paul. After serving as train despatcher and assistant to the Superin-

tendent, he was, in 1882, made Superintendent of Telegraph. In 1886 he was appointed Assistant General Superintendent, and in 1888 went to the Illinois Central as Assistant Superintendent of the Chicago division. Later in that year he was made Superintendent at Rockford, Ill., of the Chicago, Madison & Northern, now part of the Illinois Central. After serving as Superintendent of different divisions of the Illinois Central, he was appointed Superintendent of Transportation in 1891, and the next year was made Superintendent at Dubuque, Iowa. In 1893 he went to the Rome, Watertown & Ogdensburg as Superintendent. In 1899 he was made Superintendent of the Morris & Essex division of the Delaware, Lackawanna & Western, and in a few months was promoted to be General Superintendent of that road. In 1901 he was made Manager of the Intercolonial, from which position he resigned in the fall of 1902 to go into private business until he was appointed Executive Agent of the Grand Trunk Pacific.

David Willcox, who recently resigned as President of the Delaware & Hudson, shot himself on April 24 while at sea on the North German Lloyd steamship "Barbarossa." Mr. Willcox, who went abroad in ill health and had not recovered, was returning from Naples. He was born on December 12, 1849, at Flatbush, L. I. He graduated from Yale College in 1872, being valedictorian of his class. He studied law at Columbia Law School for two years, and was admitted to the bar in 1874, after which he began to practice law in New York City. He was a member of the firm of Opdyke, Willcox & Bristow, which was the General Counsel for the Delaware & Hudson from 1883 to 1898. In 1898 Mr. Willcox was made General Counsel of the Delaware & Hudson and in 1900 was made Vice-President. He was elected President in the spring of 1903. While President of the Delaware & Hudson, Mr. Willcox had a prominent part in directing the policy of the anthracite roads, particularly during the strike in 1902, when he took the stand that the miners, led by John Mitchell, were acting in restraint of trade and therefore violating the Sherman anti-trust law.

David Willcox.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

Railway Signal Association.

The May meeting of this Association will be held in the building of the American Society Civil Engineers, 220 West Fifty-seventh street, New York City, on Tuesday, the 14th, beginning at 10 a.m. The subjects for discussion are as follows: 10 to 12—Preliminary report of Committee No. 15. This report treats on Specifications for Mechanical Interlocking for Drawbridges, and changes in certain paragraphs in Mechanical Specifications adopted October 16. 12 to 1—A paper on "How to Reclaim Storage Batteries After Being Improperly Used." 2.30 to 4—Paper on "Copper Clad Steel Wire for Electric Purposes," by Byron E. Eldred. 4 to 4.30—The following questions:

1. When track relays are shunted, current is not entirely absent, with train in block. What current does the relay receive under such conditions?

2. Would a relay, able to pick up at .030 and release at 50 to 75 per cent. of the pick up, be desirable; also, with such relay could longer blocks be used?

3. What would the ideal pick up and release points be for a 4-ohm relay?

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Erie.—See Delaware & Hudson under Operating Officers.

Operating Officers.

Ann Arbor.—See Mississippi Central.

Canadian Pacific.—V. A. Harshaw, Trainmaster at London, Ont., has been appointed Superintendent of Terminals at Toronto. A. Swinnerton succeeds Mr. Harshaw.

Delaware & Hudson.—C. S. Sims, Assistant to the President of the Erie, has been appointed General Manager of the Delaware & Hudson.

Grand Trunk.—W. G. Brownlee, Superintendent of the Middle division, has been appointed to the new office of General Transportation Manager, in charge of maintenance and operation, with office at Montreal. A. A. Tisdale, Assistant to the Fourth Vice-President, has been appointed Assistant to the General Transportation Manager.

Gulf, Opelousas & Northeastern.—H. Flanders, Superintendent of the Avoyelles division of the Texas & Pacific, has been appointed General Manager of the Gulf, Opelousas & Northeastern, which has just been opened for traffic between Melville, La., and Opelousas.

Mississippi Central.—M. D. Fohey, Trainmaster of the Ann Arbor, has been appointed Superintendent of the Mississippi Central, succeeding M. H. McCabe, resigned.

New York Central & Hudson River.—David Hanna has been appointed Trainmaster of the Harlem division, with office at White Plains, N. Y., succeeding Gerard Van Tassell, promoted.

Pennsylvania.—S. C. Long, who was recently appointed General Superintendent of the Western Pennsylvania grand division, graduated from Lafayette College with a C.E. degree and began railroad work in 1881 as a rodman on construction work on the Pennsylvania. He was transferred to the Maintenance of Way department at Altoona in 1882, and in a few months was made assistant supervisor of the Pittsburg yard. The next year he was transferred to the Pitcairn yard, and in 1884 to the Philadelphia yard. In 1885 he was appointed supervisor of the Pittsburg, Virginia & Charleston, running from Pittsburg to Brownsville and Uniontown, and now the Redstone branch of the Pennsylvania. Later in that year he was transferred to Lancaster, Pa., on the main line, and in 1889 was appointed Assistant Engineer of the Delaware Railroad, now part of the Philadelphia, Baltimore & Washington. Four years later he was appointed Assistant Engineer of the Maryland division, and in 1900 was appointed Superintendent of the Bedford division. He was made Superintendent of the Allegheny Valley in 1902, and in 1903 was appointed Superintendent of the Pittsburg division, from which position he was recently promoted.

S. C. Long.

R. T. Morrow, who succeeded Mr. Long as Superintendent of the Pittsburg division, was born at Oswego, N. Y., in 1859. After a public school education and a two-year course in the New York State Normal School at Oswego, he began railroad work in 1876 in the Elmira shops of the Northern Central. In the summer of 1877 he began to prepare for Lehigh University, which he entered in the fall of 1878. He graduated with a C.E. degree in 1882 and at once re-entered railroad work in the Assistant Engineer's office at Williamsport on the Philadelphia & Erie division of the Pennsylvania. After being in charge of a location survey, he was made assistant supervisor of the Eastern division of the Philadelphia & Erie division. In 1884 he was made assistant trainmaster of the Lewisburg & Tyrone branch, and in 1891 was made supervisor at Altoona. He was appointed Assistant Engineer of the Middle division in 1893, and in 1894 was transferred to the Elmira & Canandaigua division of the Northern Central. In 1899 he was appointed Assistant Engineer of the Pittsburg division, and three years later was made Assistant Superintendent of that division. In 1904 he was appointed Superintendent of the Western Pennsylvania division, which is now a division of the Western Pennsylvania grand division, where he remained until his recent promotion.

Southern Pacific.—E. S. Luty has been appointed Trainmaster of the Salt Lake division, with jurisdiction over the First and Second districts, and office at Ogden, Utah, succeeding A. W. Wright, transferred. B. A. Campbell has been appointed Trainmaster of the Fourth district of the Salt Lake division, extending from Lovelock to Sparks, including Lovelock, Hazen and

Sparks yards, with office at Sparks, Nev. The authority of W. J. Stinson, Trainmaster of the Third and Fourth districts of the Salt Lake division, now extends over the line from Carlin to Lovelock, including the Carlin and Winnemucca yards, with office at Winnemucca, Nev.

Texas & Pacific.—See Gulf, Opelousas & Northeastern.

Traffic Officers.

Gulf, Opelousas & Northeastern.—J. W. Jordan has been appointed General Freight and Ticket Agent of the Gulf, Opelousas & Northeastern, which has just been opened for traffic between Melville, La., and Opelousas.

Michigan Central.—C. J. Hupp, Assistant General Freight Agent, has been appointed to the new office of Industrial Commissioner.

New York Central & Hudson River.—George H. Daniels, Manager of the General Advertising Department, has retired.

Northern Pacific.—G. A. Mitchell, General Agent at Spokane, Wash., has been appointed Assistant General Passenger Agent, with office at St. Paul, succeeding A. B. Smith, who resigned several months ago to go to the New York, New Haven & Hartford.

San Pedro, Los Angeles & Salt Lake.—Allen Waldbauer, commercial agent at Pittsburg, has been appointed to the new office of General Agent at that place.

Southern Pacific.—H. N. Gibson has been appointed General Agent at Monterey, Mex., succeeding E. F. O'Brien, resigned.

Wisconsin Central.—E. G. Clark, Assistant General Freight Agent, has been appointed General Freight Agent, succeeding H. F. Stohr. D. L. Freeland, General Agent at Chicago, succeeds Mr. Clark. F. B. Montgomery, General Agent at Pittsburg, succeeds Mr. Freeland. W. S. Campbell succeeds Mr. Montgomery.

Engineering and Rolling Stock Officers.

Buffalo & Susquehanna.—E. P. Lupfer, Division Engineer of the Northern division, has resigned to go into private business.

Missouri, Kansas & Texas.—William O'Herin, Superintendent of Machinery and Equipment, has been given indefinite leave of absence to recover from injuries sustained some months ago. W. H. Maddocks has been appointed Assistant Superintendent of Machinery and Equipment, with office at Parsons, Kan.

Wisconsin Central.—R. W. Cattermole, Division Engineer at Abbottsford, Wis., has been appointed to the new office of Engineer of Maintenance of Way.

LOCOMOTIVE BUILDING.

The Tampa Northern is said to have ordered four locomotives.

The New Orleans Terminal is about to buy two switching locomotives.

The Mississippi Central will shortly be in the market for several locomotives.

The New South Wales Government Railways will shortly be in the market for several locomotives.

George H. Carey, 1 Broadway, New York, is figuring on two lots of locomotives for Mexican plantations.

The Krajewski-Pesant Company, 32 Broadway, New York, is figuring on some heavy locomotives for Cuba.

The Tabasco Plantation Co., Onxaguena, Isthmus of Tehuantepec, Mexico, has ordered a locomotive from the H. K. Porter Co.

The Canadian Northern denies having ordered two eight-wheel, 50-ton locomotives from the Hicks Locomotive & Car Works, as reported in the *Railroad Gazette* of April 19.

The Philippine Railway is in the market for more locomotives. The contract will be placed through J. G. White & Co., New York. The combined locomotive and car contracts now pending will amount to about $400,000.

The Ann Arbor has ordered four simple Atlantic (4-4-2) locomotives from the American Locomotive Co., for August delivery. The specifications are as follows:

General Dimensions.

Type of locomotive	Atlantic
Weight, total	162,000 lbs.
Weight on drivers	94,000 "
Diameter of drivers	69 in.
Cylinders	19 in. x 26 in.
Boiler, type	Straight top
" working steam pressure	200 lbs.
" number of tubes	256
" material of tubes	Detroit steel
" diameter of tubes	2 in.
" length of tubes	16 ft.
Firebox, length	90½ in.
" width	62¼ "
" grate area	39.1 sq. ft.
Heating surface, total	2,292 sq. ft.
Tank capacity	6,500 gals.
Coal capacity	11 tons

Special Equipment.

Air brakes	Westinghouse-American
Axles	Midvale
Bell ringer	Gollmar
Brake-beams	Chicago
Brake-shoes	American
Couplers	Buckeye
Journal bearings	Ajax
Piston rod packings	U. S. Metallic
Valve rod packings	American Locomotive Co.
Safety valve	Crosby
Sanding devices	Leach
Sight-feed lubricators	Detroit
Springs	Ann Arbor R. R.
Steam gages	Consolidated
Steam heat equipment	Consolidated
Tires, driving wheel	Latrobe
" truck wheel	Latrobe
" tender wheel	Latrobe

The Northern of Costa Rica is in the market for eight 20-ton locomotives (narrow gage). The contract will be placed by R. B. Hubbell, Purchasing Agent of the United Fruit Co., which controls the road. Mr. Hubbell's office is room 1,612 Whitehall Building, Battery place, New York.

CAR BUILDING.

The Union Railway, it is understood, has ordered 2,300 gondola cars.

The Morgantown & Kingwood is about to buy several hundred steel coal cars.

The Starks Heater Car Company, Chicago, is in the market for 25 special freight cars.

The Chicago Union Traction Company contemplates buying from 400 to 600 city electric cars.

O. R. Whitney, Taylor Building, Cortlandt street, New York, is in the market for some flat cars.

The Southern is in the market for 150 box cars, and is reported to be in the market for 150 cabooses.

The Tabasco Plantation Co., Oaxaguena, Isthmus of Tehuantepec, Mexico, has ordered 70 cane cars.

The Duluth, Missabe & Northern, it is reported, is considering the purchase of various kinds of freight equipment.

The Milwaukee Refrigerator Transit Company, Milwaukee, as reported in the *Railroad Gazette* of February 8, is building 100 refrigerator cars at its own shops.

The Elgin, Joliet & Eastern, as reported in the *Railroad Gazette* of April 19, is asking bids on 3,000 freight cars of various kinds, and is considering the purchase of 50 steel box cars.

The Union Railroad, as reported in the *Railroad Gazette* of April 19, is in the market for 2,300 gondola cars of 100,000 lbs. capacity, and 400 wooden box cars; also is considering the purchase of 100 steel box cars.

The Philippine Railway is in the market for more cars, both freight and passenger. The contract will be placed through J. G. White & Co., New York. The combined car and locomotive contracts now pending will amount to about $400,000.

The Intercolonial, as reported in the *Railroad Gazette* of April 19, has ordered, from Rhodes, Curry & Co., five Bohn refrigerator cars of 60,000 lbs. capacity, 70 Hart convertible cars of 80,000 lbs. capacity, 100 box cars of 60,000 lbs. capacity, and 130 15-ton hopper cars of 30,000 lbs. capacity. The refrigerator cars will weigh 39,700 lbs. and will measure 28 ft. 9½ in. long, 8 ft. 1¼ in. wide and 7 ft. 6¾ in. high, inside measurements, and 36 ft. long, 9 ft. wide and 12 ft. 11⅝ in. high, over all. The Hart convertible cars will weigh 36,900 lbs., and will measure 32 ft. 2 in. long, 8 ft. 8 in. wide and 3 ft. ¼ in. high, inside measurements, and 34 ft. long, 9 ft. wide and 7 ft. 7½ in. high, over all. The box cars will weigh 34,800 lbs., and will measure 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, inside measurements, and 36 ft. 9⅝ in. long, 9 ft. 2¼ in. wide and 13 ft. $3^3/_{16}$ in. high, over all. The hopper cars will weigh 20,700 lbs., and will measure 15 ft. 10½ in. long, 8 ft. 3 in. wide and 6 ft. 9 in. high, inside measurements, and 16 ft. 10 in. long, 8 ft. 6½ in. wide and 9 ft. 5 in. high, over all. Bodies and underframes of all cars will be of wood. The special equipment for all includes:

Bolsters	Simplex
Brake-beams	Simplex
Brake-shoes, for all except Hart Convertible	Christy
Brakes	Westinghouse
Door fastenings—Refrigerator cars	Malleable
Door fastenings—Box cars	National Lock Washer Co.
Doors—Box and refrigerator cars	Intercolonial standard
Draft rigging	Miner tandem
Dust guards	Harrison
Paint—Refrigerator cars	White lead
Paint—All others	Red oxial
Roofs—Box cars	Chicago Galvanized Corrugated Iron Car Rfg. Co.
Roofs—Refrigerator cars	Wood
Springs	Intercolonial standard, hopper only
Trucks, for all except hopper cars	Simplex

The Northern of Costa Rica is in the market for 100 gondola

and 100 box cars (narrow gage). The contract will be placed by R. B. Hubbell, Purchasing Agent of the United Fruit Co., which controls the road. Mr. Hubbell's office is room 1,612, Whitehall Building, Battery place, New York.

RAILROAD STRUCTURES.

ALBANY, N. Y.—The New York Central & Hudson River, local reports state, will make improvements at its West Albany shops, to include new buildings and extensions to existing structures.

ALLENTOWN, PA.—Extensive improvements, it is said, are to be made at this place by the Central of New Jersey and the Lehigh Valley Railroads. These two companies agree to pay $18,400 towards the bridge at Tilghman street.

Negotiations are under way for rebuilding the bridge at Glendon over the Lehigh Valley tracks and the canal. When completed the structure is to be maintained by the railroad company.

AMES, IOWA.—The Fort Dodge, Des Moines & Southern, it is said, will put up a new station, also a car barn here.

CLINTON, IOWA.—According to local reports, the Chicago & North-Western is to make improvements, including a steel bridge to carry two tracks over the Mississippi river, a new station, improvements to freight terminals, a large roundhouse and new shops.

COLUMBUS, OHIO.—The Pennsylvania, it is said, will make additions and improvements to its freight house here at a cost of about $50,000.

HAVRE DE GRACE, MD.—The Baltimore & Ohio, it is said, is to replace the present single-track bridge over the Susquehanna river with a new structure to carry two tracks. The cost of the improvements will be about $2,000,000.

JOHNSTOWN, PA.—The Pennsylvania, the Cambria Steel Company and the city authorities are to build an overhead bridge from the central part of the city to the Twelfth ward.

LONDON, ONT.—The Pere Marquette, it is thought, will build two steel bridges in this city at a cost of $50,000.

MACKEY FERRY, N. C.—The Norfolk & Southern, it is said, has given a contract for building a trestle across Albemarle Sound, 5½ miles long, to cost $379,000, to the McLean Construction Company, of Baltimore. According to the terms of the contract the work must be finished by March 1, 1908.

NEW FLORENCE, PA.—The Pennsylvania, it is said, has submitted plans to the Borough Council for a subway 17 ft. high and 40 ft. wide at Legonier street under its tracks, which are to be raised 7 ft. at that place.

PHOENIXVILLE, PA.—The electric railroads have submitted to the County Commissioners a proposition to pay $25,000 towards the cost of the new steel bridge to replace the present Gay street bridge. The companies are to be allowed to operate street cars over the new structure.

PONTIAC, MICH.—The Grand Trunk is planning to put up a new station here to cost $25,000.

STRATHCONA, ALB.—Plans are being made for a new station to be built here at a cost of $65,000.

TORONTO, ONT.—The Grand Trunk, it is said, will build 20 new stations in Ontario this year.

WILLIAMSPORT, PA.—Work is about to be started by Rogers Bros., of Albion, who have the contract for the Campbell street undergrade crossing, and expect to have the work finished in about four months. The Pennsylvania is to pay $18,700 of the $39,000 which the proposed subway is to cost.

WINNIPEG, MAN.—The city council has decided that the Midland of Manitoba must build six concrete subways in connection with its entrance into Winnipeg.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ASTORIA & COLUMBIA RIVER.—According to local reports, on the extension which this company is building from Cartwright, Ore., south to Tillamook, 45 miles, there will be 17 tunnels aggregating 19,000 feet in length. (March 15, p. 379.)

BESSEMER & LAKE ERIE.—Surveys are about finished for building an extension of the Western Allegheny from Kaylor, Pa., northeast to Reidsburg, where connection is to be made with the Franklin & Clearfield, now being built by the Lake Shore & Michigan Southern. The work includes a steel bridge over the Allegheny river near East Brady.

Officials of this road have authorized the expenditure of $100,000 for additional tracks near Greenville, Pa. This, it is said, brings the total appropriations for track and shop improvements on this road for the present year up to $1,000,000.

BLANEY & SOUTHERN.—See Minneapolis, St. Paul and Sault Ste. Marie.

BUFFALO, ROCHESTER & EASTERN.—Incorporated in New York with a capital of $3,500,000 and office at Rochester. This company, composed of men interested in street railroads in Massachusetts, proposes to build a line to parallel the New York Central from Buffalo east to Rochester and thence to Troy, 300 miles. The directors are: R. D. Gillett, H. W. Ely and A. D. Robinson, Westfield, Mass.; A. W. Eaton, Pittsfield; F. Weston, Dalton; H. W. Bowman, F. T. Ley, Springfield; J. O. Skinner, Holyoke; J. H. Caldwell, Troy; J. J. Whipple, Brockton, and J. F. Shaw, Manchester.

CHICAGO, OTTAWA & PEORIA.—Incorporated in Illinois with $50,000 capital to build a line from Chicago southwest to Peoria, 150 miles, with a branch from Ottawa west to Princeton, 35 miles. The incorporators include: H. E. Chubbock, of Ottawa, and W. A. Carnahan, C. Zilly, C. A. Wright and G. Mattis, of Champaign.

CIMARRON & NORTH WESTERN.—See St. Louis, Rocky Mountain & Pacific.

COLORADO ROADS (ELECTRIC).—Plans are being made to incorporate a company with $2,000,000 capital, in which Greeley and Denver capitalists are interested. The company is being formed to build an electric line from Greeley, Colo., south to Denver, about 58 miles. The proposed line is to run between the Colorado & Southern and Union Pacific, paralleling the latter into Denver.

COLUMBIA, KENTON & LIMA (ELECTRIC).—This company is to be incorporated in Ohio, as a consolidation of the Columbus, Urbano & Western, the Lima, Kenton & Marion, and the Delaware, Megantic Springs & Northern Traction.

COLUMBUS, URBANO & WESTERN.—See Columbia, Kenton & Lima Electric.

DELAWARE, MEGANTIC SPRINGS & NORTHERN.—See Columbia, Kenton & Lima Electric.

LIMA, KENTON & MARION.—See Columbia, Kenton & Lima Electric.

MEXICAN CENTRAL.—According to Vice-President H. R. Nickerson, this company has made surveys for an extension from Balsas, south via Chilpancingo to Acapulco, on the Pacific coast, about 100 miles, to complete the through line from the City of Mexico to Acapulco.

This company, it is reported, has given a contract to the Atlantic Construction Company, of Boston, for building the proposed extension to Tampico. Some of the work has been sublet to Belle & Somers, of Mexico City.

MEXICAN ROADS.—A concession has been granted to Inigo N. Noriega to build a line from Mexico City southeast to Chalco, in the state of Mexico, about 20 miles. By the terms of the concession, surveys must be begun within one month, six miles built the first year, and the entire line finished by the end of the second year.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—This company, it is said, has bought the Blaney & Southern, a logging railroad eight miles long, operating from Blaney Junction, Mich., north to Bear Creek, and proposes to build an extension north about 10 miles to Germfask, where a connection is to be made with the Manistique Railway.

MONTEREY, FRESNO & EASTERN.—Work has been started on the construction of a 1,500-ft. wharf at Monterey, Cal., the ocean terminus of this proposed line. The company has been incorporated with a capital of $5,000,000 to build a line from Fresno, Cal., west to Monterey, about 140 miles. The new line is being built as a steam road, but it is probable that it will be converted into an electric line within a few years. It is the intention of the San Francisco capitalists who are interested in the company to extend the road at some future time. In locating the final surveys, a route was selected with such grades as will obviate the danger of flooding the tracks along the Salinas river valley and at other points where the existing railroads suffered much interruption of traffic during the spring freshets this year. The distance from Monterey to Salinas by the new road will be 16½ miles. Although the heavy freight shipments that are expected from the fruit and raisin districts surrounding Fresno and the diversified farming products of the intervening territory will furnish the greater portion of the new road's revenue, a large passenger traffic is expected also, especially in summer. The 400-ft. wooden truss bridge across the Salinas river is the only important bridge. There are no difficult engineering features, but there is to be a loop at the Rocks at San Juan, where the road will follow the contour of the hill. In entering Monterey the line nearly parallels the Southern Pacific and runs through the streets near the business center. Rails have been ordered and grading will be commenced at Hollister in May. Gangs of graders will work both ways. A. D.

Bowen is President, and E. W. Wilson, the Vice-President of the American National Bank of San Francisco, is Treasurer. The cost of construction and equipment of the line is estimated at $2,500,000. Cars and locomotives have already been ordered sufficient for the first year's requirements. It is announced by the management of the company that the Watsonville Transportation Company's six-mile electric road has been bought. This extends west from Watsonville to Port Watsonville, on the Pacific ocean. The freight and passenger steamer "F. A. Kilbourne" is included in the purchase. This vessel will make regular trips between San Francisco and Port Watsonville and Monterey, connecting with the trains of the Watsonville branch road, which will be connected with the main line at San Juan.

New York Subways.—Bids are wanted by the Board of Rapid Transit Commissioners May 14 for building a section of route No. 9, in Centre street, between Canal street and Broome street, in the Borough of Manhattan. The general plan of construction calls for a sub-surface railroad. There are to be four tracks in Centre street and provisions for a spur turning west into Grand street. Separate bids are asked for the construction of pipe galleries in the same section. Bion L. Burrows, Secretary, 320 Broadway.

No bids were received April 25, on which date the Board of Rapid Transit Commissioners was to open bids for the construction of rapid transit railroads (subways) for the Lexington avenue line, and for the Seventh and Eighth avenue lines. (April 12, p. 531.)

Oklahoma & Texas.—President G. V. Stone, of Oklahoma City, is quoted as saying that arrangements are to be made to start work on this proposed line. Surveys were made about two years ago from Oklahoma City to Wichita Falls, Tex., 200 miles. It is the intention of the company to finish the section from Oklahoma City to Lindsay, Ind. T., as soon as financial arrangements have been made.

Pacific Railway & Navigation.—A contract has been let by this company for the construction of a tunnel 1,400 ft. long, five miles west of Buxton, Ore., to which point the road has been completed, on the extension building north to Veronia. (March 15, p. 388.)

Pennsylvania.—The new line under construction from a point on the Buffalo division, running parallel to the Terminal Railway of Buffalo from Gardenville to a point just west of the crossing by the Buffalo, Rochester & Pittsburg, across that road, thence northwest crossing the Nickel Plate, the Buffalo & Southwestern branch of the Erie and the Lake Shore overhead, and coming down to grade near the Ridge road, where a delivery yard and regular freight station will be established, is nearing completion. North of this point, connection is to be made with the South Buffalo Railroad, running into the steel plant, and the Buffalo & Susquehanna Iron Co.'s furnace, and to the railroad's large ore-dock property and lake terminal facilities just north of the city. This line is slightly in excess of seven miles long and is being built to facilitate the movement of freight to and from the South Buffalo industries and the railroad company's canal, ore-dock and coal handling facilities.

St. Louis, Rocky Mountain & Pacific.—This company has built a standard gage railroad from Des Moines, on the Colorado & Southern, 80 miles south of Trinidad, Colo., to Ute Park, at the foot of Baldy Mountain, adjoining the Elizabethtown mining district. Including a branch of seven miles from Clifton House to Raton, and one of three miles from Koehler Junction to Koehler, the line is 106 miles long. From Des Moines to Cimarron is prairie. Above Cimarron the road threads the winding Cimarron Canon, not unlike the Grand Canon of the Arkansas in Colorado, and the grades run up to 2.1 per cent. maximum compensated for curvature. On the main line 80-lb. rails have been laid. At Clifton House the road spans the Canadian river and crosses the Santa Fe overhead with three deck plate girder spans, two of 60 ft. each and one of 30 ft. The supporting masonry is concrete. The other bridges on the road are timber trestles. The road connects with the Santa Fe at Raton and Preston, and, with the Dawson branch of the El Paso & Southwestern at Vermejo. The Raton branch crosses the Santa Fe overhead between Clifton House and Raton. At Vermejo the intersection of the El Paso & Southwestern is at grade, with interlocker. Suitable shops have been located at Cimarron. The road has a much better water supply than that of southern New Mexico. Operation of the entire line began in February. An extension westward 40 miles to Taos is projected. The Rocky Mountain Company's most important mining operation is at Koehler. The company will have 200 coke ovens in operation by July 1, to supplement 186 already in operation at Gardiner, near Raton. The full complement of ovens should produce about 175,000 tons of coke per annum. The Raton field yields high grade bituminous steam and coking coal, low in sulphur and well adapted to transportation. The principal market for the coal of the Raton field is in the El Paso district, and the copper mining and smelting regions of Arizona and Mexico. To reach the timber on the eastern slope of the Rocky Mountains the Cimarron & North Western Railway is under construction from Cimarron northwest 22 miles up the Ponil river. This line is designed as a feeder to the St. Louis, Rocky Mountain & Pacific.

St. Louis, Terre Haute & Quincy Traction.—Incorporated in Illinois with a capital of $25,000 and office at Springfield. The company proposes to build an electric line from a point in Illinois opposite Terre Haute, Ind., west to Quincy, Ill., about 225 miles, and eventually south to St. Louis, Mo. The incorporators include: E. Yates, of Pittsfield; H. T. Wilson and H. C. Simmons, of Virden; P. Chase, of Decatur, and E. E. Barclay, of Springfield.

Southern.—The new line which this company is building from Jasper, Ind., northeast to French Lick Springs, will be finished about December 1. Landslides have caused considerable damage to the work in the neighborhood of French Lick Springs. This extension has been under construction for almost two years. It has been delayed by high water, by landslides, and by the difficulty experienced in boring a tunnel about four miles from French Lick Springs. The tunnel is to be 2,200 ft. long, 21½ ft. high and 16 ft. wide. It is to be lined throughout with reinforced concrete, and will cost when finished about $325,000. Four miles of track have been laid from French Lick Springs and six miles from Jasper. The roadbed is ready for the ties on the remaining 15 miles.

Vancouver Railroad.—C. H. Cobb, C. H. Healy and associates, of Seattle, Wash., it is said, will build a 25-mile line through timber lands on Vancouver Island.

Western Allegheny.—See Bessemer & Lake Erie.

RAILROAD CORPORATION NEWS.

Atchison, Topeka & Santa Fe.—Holders of the $103,001,000 common and the $114,173,730 preferred stock are given the right, until May 10, to subscribe to an issue of 10-year, 5 per cent. convertible bonds, at par and accrued interest, to the extent of 12 per cent. of their holdings in stock. The bonds are convertible into common stock until June 1, 1913.

Chattanooga Southern.—W. W. Kent and E. C. Osborne have been appointed receivers of this road, which runs from Gadsden, Ala., to a point near Chattanooga, Tenn., about 100 miles, including branches. The receivers were appointed on application of the Pacific Construction Company, which owns bonds on which interest has been defaulted. The sale of the Chattanooga Southern to the Louisville & Nashville has been pending since October, 1906.

Chesapeake & Ohio.—This company has arranged to sell to Moffat & White and Proctor & Borden $600,000 4 per cent. 40-year Potts Creek branch bonds. They are secured on the line being built from Covington, Va., southwest 25 miles, which, it is expected, will be in operation by July 1.

Consolidated Railway (New York, New Haven & Hartford Electric Lines).—See New York, New Haven & Hartford.

Denver & Rio Grande.—The United States Supreme Court has given a judgment for $1,808,272 in favor of R. S. Raphael against the Wasatch & Jordan Valley, which runs from Bingham, Utah, to Alta, 44 miles, and is now a part of the Rio Grande Western. When the road was built, 30 years ago, $884,000 7 per cent. mortgage bonds were issued, of which Nathan Raphael bought $680,000, but interest was defaulted in 1882 and the present owners bought the property under foreclosure. The suits terminating with the above decision were started by Nathan Raphael and continued after his death by his son. The above judgment represents principal and accrued interest.

Louisville & Nashville.—See Chattanooga Southern.

Mobile & Ohio.—This company has sold to the Mississippi Valley Trust Company and Francis Bros. & Co., St. Louis, $1,291,000 5 per cent. equipment trust notes maturing serially up to October 1, 1914. The notes, which are guaranteed by the American Car & Foundry Company, cover 1,000 box cars and 750 gondolas.

New England Investment & Security.—The $10,000,000 4 per cent. preferred stock of this company is being offered to the public at 92½ and accrued dividends. It is stated that about $7,000,000 has been sold. The company is the holding company for the New York, New Haven & Hartford electric lines in Massachusetts; it was formed last year, and the dividends on the preferred stock are guaranteed by the Consolidated Railway, which owns all of the $10,000,000 common stock.

New York, New Haven & Hartford.—A meeting of the stockholders of this company has been called for May 31 to ratify the merger of the Consolidated Railway with the New York, New Haven & Hartford.

See New England Investment & Security.

Wasatch & Jordan Valley.—See Denver & Rio Grande.